Published Semi-Monthly

Volume 93

October 1, 1945

Number 7

JUL AN CHASE, Vice-Pres. and Directing Editor
JOS. GESCHELIN, Detroit Editor
JEROME H. FARRIS, Ass't Editor
MARCUS AINSWORTH, Statistician
L. W. MOFFETT, Washington Editor
EUGENE J. HARDY, Washington News Ed.
DAVID J. ANSBORO, JR., Washington News Ed.

#### CONTENTS

Planned Economy and Full Employment.	
By Nicholas E. Peterson	15
Labor's Wrench in Reconversion Machin-	
ery. By Leonard Westrate	17
German Turbo-Jet and Liquid Rocket Units	18
Hudson to Build Super and Commodore	
Series on 121 in. Wheelbase	22
Douglas C-74 Transport	24
German Jet Planes	29
Pontiac Production Starts with Streamliner	
Two-Door Sedan	30
Emphasis on Interchangeable Tooling and	
Cutting Fluids at Tourek Plant. By	
Joseph Geschelin	32
New Production Equipment	35
Electronic Analysis of Airplane Hydraulic	
Braking Systems. By Duncan B. Gardner	36
Superchargers for Motor Vehicle Engines.	
By Joseph Geschelin	38
Intercooler Tube Design. By Frederick H.	00
Green and Leighton S. King	40
New Products for Aircraft	44
New Products	46
News of the Industry	48
Determining Iron Content of Aluminum	
Alloys	54
Advertisers' Index	202

Copyright 1945 by Chilton Company (Inc.)

Automotive Division G. C. Buzby, President and Manager E. H. MILLER, Adv. Mgr. E. W. HEVNER, Cir. Mgr.

H. MILLER, Adv. Mgr.

OFFICES

Philadelphia 39, Pa., Chestnut & 56th Sts., Phone Sherwood 1424

New York 17, N. Y., 100 East 42nd St., Phone Murray Hill 5-8600;
Chicago 1, Ill., Room 916, London Guarantee & Accident Building, Phone Franklin 4243; Detroit 2, Mich., 1015 Stephenson Bldg., Phone Madison 2000; Cleveland 14, Ohio, 1030 Guardian Bldg., Phone Cherry 4188; Washington 4, D. C., 1061 National Press Bldg., Phone District 8109 and 8110; San Francisco 5, Calif., 605 Market St., Room 708, Phone Douglas 967; Los Angeles 1, Calif., 6000 Miramonte Blvd., Phone Lafayette 5525. Cable Address .....Autoland, Philadelphia

Member of the Audit Bureau of Circulations Member Associated Business Papers, Inc.

AUTOMOTIVE and AVIATION INDUSTRIES is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by CHILTON COMPANY (INC.)

Executive Offices
Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A.

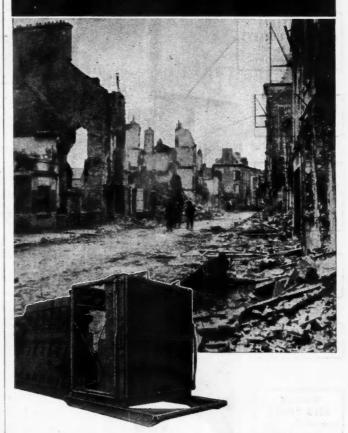
Officers and Directors

C. A. MUSSELMAN, Chairman of the Board Jos. S. HILDRETH, President

Vice-Presidents GEO. H. GRIFFITHS
C. S. BAUR
WILLIAM A. BARBER, Treasurer
HOMAS L. KANE
G. C. BUZBY
CHARLES J. HEALE

WILLIAM H. VALLAR, Asst. Treas.

### **BRINGING LIGHT** to DARKENED CITIES



• Diesel driven generators by the hundreds are being used by the United Nations to lift the shroud of darkness from war-torn European cities. Many of these portable light plants are equipped with specially designed Young "Full Flow" Coolers, thermostatically controlled to maintain engine jacket water and lube oil at efficient operating temperatures. The Young unit illustrated here is an integral part of the Baldwin Locomotive engines that develop 465 hp. at 428 rpm. for an output of 315 kilowatts. Once again Young engineering has met the challenge of a specialized assignment in the internal combustion engine field. Heat transfer engineering today is a highly developed science ... there isn't time for trial and error methods. Consult with the Young staff . . . take advantage of its wide experience . . . without obligation.

#### **HEAT TRANSFER PRODUCTS**

Oil Coolers • Gas, Gasoline, Diesel Engine Cooling Radiators • Intercoolers • Heat Exchangers • Engine Jacket Water Coolers • Unit Heaters • Heating Coils • Cooling Coils • Convectors • Condensers • Evaporators • Air Conditioning Units e and a Complete Line of Aircraft Heat Transfer Equipment.

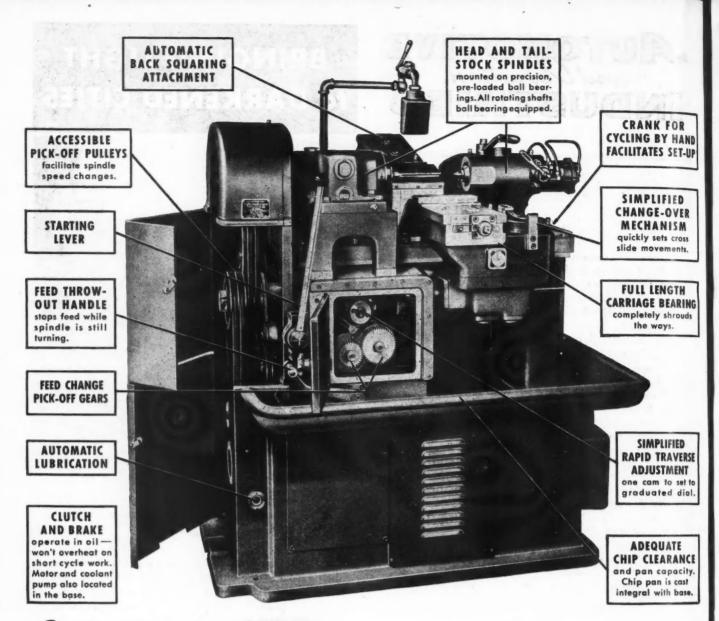
YOUNG RADIATOR CO., Dept. 215-K, RACINE, WIS., U.S.A.

October 1, 1945

ES

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

AUTOMOTIVE and AVIATION INDUSTRIES. Vol. 93, No. 7. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and al Latin-American countries, \$1.00 per year. Canadian and Foreign \$2.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15th). 50 cents.



# So-swing IMP...

A Small, Fully-Automatic Lathe with Unlimited Tooling Possibilities

• Designed primarily for work demanding high speeds and extreme accuracy, the IMP's sturdy, compact design makes it equally suitable for turning heavier work such as small pistons, bushings, gear blanks, etc.

Noteworthy IMP features are graphically presented in the above illustration. Note the compactness and accessibility of the parts which require a change in setting when changing over from one job to another. Aside from a change in tool blocks, there are only four adjustments to make: first, change of spindle speeds (when required) thru pick-off pulleys; second, change of feed pick-off gears (when required); third, setting of one graduated sector in carriage to control movements of the front carriage cross slide; fourth, setting of one rapid traverse cam to graduated dimensions on the dial.

Another important IMP feature is the extremely long carriage bearing on the ways, obtained thru a unique head and tailstock design which permits the carriage slides to pass under them. Since the carriage is mounted on a flat and "V" way exceptionally fine finishes are possible with light cuts using carbide and diamond point tools.

The spindle is mounted on selected precision ball bearings, and speeds up to 5000 RPM may be maintained. The machine cycle is started by a hand lever which may also be used for emergency stops at any point within the cycle and, of course, the machine stops automatically at the end of its cycle. All shafts are mounted on anti-friction bearings and the main parts, including the carriage ways, are automatically lubricated.

The Lo-swing IMP lends itself to practically unlimited tooling possibilities. A Third Slide or Overarm for additional facing or chamfering operations can be furnished as well as a number of other special attachments. Send us your prints or write for complete information about this versatile lathe.

### SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

October 1, 1945 Volume 93, No. 7

### Planned Economy and Full Employment

By Nicholas E. Peterson

Vice-Pres., First National Bank of Boston

MPLOYMENT for all those willing and able to work is the goal set for the postwar period by various groups in this country and in Great Britain. Discussion of the subject centers around the idea that every person who wants to work has a right to a job, and that the Government should assume responsibility for the fulfillment of this objective. Various Federal officials have set 60,000,000 as the number of jobs to be provided in the first year of the post-war period. To implement this goal, the Murray Bill was introduced in Congress. It provided originally that the Government in effect would guarantee work for all.

This is not a new idea. Under feudalism and the old slave system everyone was provided with steady work and security in old age. But the price paid was the loss of individual freedom. This same condition would prevail under any system of guaranteed work and security, for in order to fulfill its promise the Government would of necessity control prices, wages, production, location of industries, consumption and distribution of income, and the like. In fact, the economic affairs of the nation would be under the control and guidance of the party in power.

Under a free society, jobs in the final analysis are created in the market place. It is the consumer by his preferences who determines the type and amount of goods to be produced. And from this marketable production stem wages to workers, income to capital, and taxes to government. Our system operates on the basis of spontaneous and unconscious cooperation brought about by the exchange of goods and services which is automatically regulated by prices and profits. The amount of goods and services to be offered, as well as compensation therefor, is essentially determined by competitive conditions at the market place. To function smoothly our economy must be kept within reasonable balance and without undue Governmental interference in order that there may be a regular flow of goods from producers' to consumers' channels.

Our post-war program should be geared to a dynamic and not a static system patterned after the feudalism of the Middle Ages. There are grave dangers in sugar-coated slogans that have the appearance of short cuts to Utopia but which in reality lead down the road to serfdom. A subsidized economy built on Federal crutches cannot endure. Our economy should instead rest upon private initiative and free enterprise, the pillars upon which the American system has been built and without which it cannot survive. This system, with all its defects, is the best that has yet been devised, and over the years has provided a high level of employment except in the 1930's, when the pump-priming program was adopted that drove job-creating capital into hiding. The country has emerged from the war with the greatest productive capacity and the most highly developed mass production technique ever known. We have the tools, resources, manpower, the know-how, and a domestic market capable of absorbing all but a small proportion of our output. We should be able to combine these facilities into a workable program, based upon the principles underlying the American system, that would insure a high level of employment and reasonably high living standards.

UP.

NG

ds

ial.

ely

1 8

he

ri.

lly

ar

all

in-

ver

my ine

fts

ain

tic-

un-

er-

eial

IES

15

### BROACHING 2.4 MILES OF



Using a CINCINNATI Broaching Machine for cutting teeth in hack saw and band saw blades is a new idea which could be used profitably by manufacturers of long parts requiring repetitive cuts along one edge. Here is how it's done. A CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach is equipped with receding work table, with combination hydraulic and electrically controlled work holding fixture. Several steel strips are stacked vertically, depending on their width and thickness, and the operating cycle proceeds as follows:

- 1) Ram descends, broaching 2" wide cut.
- 2) Table retraces to "clear" position.
- Ram returns to starting position. During this time the work is unclamped, automatically shuttled sideways and reclamped.
- 4) Table advances to cut.
- 5) Ram descends and cycle repeats.

At conventional ram speeds, the machine can produce 321 cuts per hour, or 2.43 miles of saw teeth in 24 hours. ¶ You may be able to use this broach technique on work right in your own shop. Our engineers will be glad to talk it over with you.

two illustrations above setup of the machine -up of the operation. New CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach Ma-chine. Catalog M-1389 contains complete specifications. For the new Duplex machine, write for Catalog M-1387.

AVI

pea

a f

is 1

den

Thi

con

day

eith

mai

hea

par

sub

acr

suc

wa

fou

no

fina

ora

fro

wi

ma

sta

00

THE CINCINNATI MILLING MACHINE CO.

CINCINNATIO, ONIO U. S. A.

MILLING MACHINES

BROACHING MACHINES

CUTTER SHARPENING MACHINES

# Labor's Wrench in Reconversion Machinery

WITHOUT risk of understatement with respect to the present aspect of the automobile industry's labor relations, it can be said that the full measure of their seriousness and the date of their peak development will not be determinable for at least a few weeks. Some observers say the critical stage is now upon us. Others think there may be a subsidence and then a flow back to flood tide next spring. This divergence of opinion clearly demonstrates the complexity and confusion that dominate the field today. It is not simply a case of unions demanding more money for their members and management either acceeding to or refusing the demand. There are many more irons in the fire that have not yet been

heated to the glowing point. Apparently union strategy calls for their subordination to the principal issue of an ostensible 30 per cent wage increase across the board. After that is settled, such benefits as guaranteed annual

wages, sick leave with pay, and similar issues can be fought out.

Confusion is the order of the day right now, and no observer in his right mind will predict with any finality what is going to happen. There is much gusty oratory from the union and a large measure of silence from the industry, neither of which is of much help in determining basic facts. The water also is muddied by conflicting cross currents of factionalism and politics, both union and national. Nowhere in all the windy wordage does the union get down to the basic issue of whether the wage increase it demands is legitimate and sound.

Perhaps there is a measure of desperation in the stand of the union leaders. Top union officials are

under fire from chesty locals which have seen the Kelsey-Hayes Wheel Co. employees defy the international union successfully for more than a month in an "unauthorized" strike which was a major factor in closing down the Ford Motor Co. For several weeks now, these top officials, following the old horse-trading technique of asking twice the acceptable figure, have been talking about how they would get a 30 per cent increase and now it is doubtful that they could prevent a strike if they

were to wangle even 15 per cent. Thus, they may be forced into a strike, which, according to sources familiar with union thinking, they do not want right now. It is not in accordance with union practice to "pull" a strike in the dead of winter when the discomfort of maintaining picket lines and the added cost of living work increased hardship on members. Also, if a strike is called now when most companies are not yet in production, the economic pressure of the announced plan to concentrate on one company at a time while its competitors are reaping a harvest of new car business is bound to be far weaker than it would be later. One of the cardinal points of this plan is to maintain strict discipline among locals of

competing manufacturers and their suppliers in order to keep production at top speed and to hasten capitula

tion of the single company under pressure. However, this part of the plan, at least, has apparently foundered on the rocks of union factionalism. Units of UAW-CIO at all of the Big Three have almost simultaneously approved strike votes and have filed formal notice with NLRB to this effect.

One development which may delay strike action is the announcement by the union that interim pay increases less than the 30 per cent demanded may be accepted by locals if they are not taken as final determinations. This appears to be a retreat from the adamant stand publicly presented at first, and it is impossible of interpretation in light of the tangled web of politics and confusion that now envelops the

(Turn to page 94, please)

By Leonard Westrate

October 1, 1945

chine

tion.

### German Turbo-Jet and

THE material in this article is from a detailed report on German warplanes prepared by the British Air Ministry and released in this country by the War Department through the Air Technical Service Command at Wright Field. Most of the data were collected by American and British Air Intelligence during the war in Europe, but after V-E Day additional data were obtained through interrogation of German scientists and engineers. This article reveals the wide scope of jet propulsion developments that were taking place in Germany and presents vital engineering information of importance to aircraft engineers and designers.

HE German Air Ministry introduced, early in the war, a system of abbreviations for use when referring to turbo-jet, or rocket units. These were:

R—Recket

TL-Turbo-jet

PTL-Propeller-turbine unit

L—Propulsive duct ("Athodyd" or "ram jet")

IL—Intermittent propulsive duct (flying bomb propulsion unit)

RL-Combined rocket and athodyd.

A six-figure code number was also introduced, the first three numbers (109) indicating turbojet or rocket units as a class. The second group of three figures indicates the particular unit. Thus, the Heinkel-Hirth He S 11 is officially designated 109-011. Subsequent to the introduction of the 011, the final figure was used to indicate the firm. Thus all Heinkel-Hirth designations end in "1" (109-011, 109-021, etc.) Junkers units in "2" (109-012, 109-022, etc.), and BMW in "8" (109-018, 109-028, etc.) Occasionally the figure 9 was used in place of "109." When the second group of figures is above 500, the designation applies to a rocket unit. Thus the propulsion unit for the Me 163 is designated 109-509.

### Junkers Flugzeug—und Motorenwerke A.G. Junkers Jumo 004 (109-004) Turbo-Jet Unit

(Note: Main description applies to Jumo 004 B)

TYPE — Eight-stage axial-flow compressor with single-stage turbine.

COMPRESSOR — Light-alloy compressor casing built in two halves and bolted together. Compressor rotor consists of eight light-alloy disks bolted together and located by pilots. A tie-10d passes through the center of the disks. Disks increase in diameter from the low to the high-pressure end. Outer casing diameter uniform throughout its length.

Blades dove-tailed into staggered grooves on periphery of disks, and fixed by set screws through each root. Stagger of the blades increases and the chord decreases in successive stages through the compressor and the width of the disk heads becomes correspondingly smaller. All the blades are constructed of light alloy.

ched t

he from

ices, e

paring

Cooli!

mpres

rroun

embly.

e spa

ner w

nst c

ass th

f the

asses

bout t

tage a

unnels

Powe

04 tur

Spannax. b

Teinke

Fuel

Span

Max. reight Full

20 mil Full

min

Ceili

veight 02 mp

leink

The

shou

urbo-

Octo

Max.

Between each compressor stage are stator blades fixed to the outer casing and built up in two halfrings. There is a row of empty guide vanes and a row of stator vanes between each compressor

stage, making 17 rows in all. The entry guide vanes and first row of stator blades are of fairly thick airfoil section light alloy, the second row being of thinner airfoil section, and the remainder constructed of cambered sheet steel.

The rotor turns in two steel shafts which are at-

#### Specifications of German Jet Prop

#### Arado Ar 234B-Bomber and Reconnaissance

Power plant—Two Jumo 004 jet units underslung beneath wing; rocket-assisted take-off (ATO); fuel capacity 836 Imp. gal.

Span—47.375 ft; wing area—298 sq ft (gross); length—

Span-47.375 ft; wing area-298 sq ft (gross); length-41.63 ft; height-13.71 ft (to top of fin); tailplane span-16.44 ft; track-6.5 ft.

Normal flying weight—18,500 lb; highest permissible take-off weight, without ATO—19,500 lb, with ATO—22,000 lb.

Max. speed—470 mph at 19,700 ft; service ceiling—37,700 ft; take-off run with 3300 lb bomb load unassisted—5850 ft, assisted—2820 ft.

#### Arado Ar 234C (Airframe similar to B series)

Power plant—Four BMW 003 jet units.

Max. speed—546 mph at 20,000 ft; service ceiling—37,000 ft; rate of climb—3600 fpm (sea level); endurance (without drop tank)—40 min. at full thrust; 1 hr 25 min. (at 60% power; take-off run—4650 ft (wing loading 81 psf without ATO units).

#### Bachem Aircraft BP20 "Natter" (Viper)—Interceptor fighter

Power plant—Walter liquid rocket unit.
Wing area—1250 sq ft; max. speed—over 600 mph at 16,000 ft; initial rate of climb—over 37,000 fpm (with auxiliary take-off units).

#### DFS 346 (design stage)

Power plant—Two Walter liquid rocket units. Max. speed—1700 mph at 100,000 ft.

# Liquid Rocket Units

### and the Planes They Powered

ched to the outside faces of the first and last disks. he front compressor bearing is made up of three ball ces, each capable of taking end thrust. The rear garing consists of a single roller race.

s in com-

disk

ngly

con-

tage

uter

nalf-

npty

ator

anes

rfoil

air-

ered

at-

let-

be-acity

gth— pan—

TO-

37,700

-5850

37,000 with-. (at with-

nter

auxi-

RIES

Cooling air is bled off between the fourth and fifth mpressor stage and is led into the double skin which grounds the whole of the combustion chamber asembly. A small amount of air is allowed to pass into e space between the combustion chambers and the mer wall. Most of the air passes down one of the exaust cone struts to circulate inside the cone and to is through small holes to cool the downstream face the turbine disk. Some of this cooling air also asses into a double skin which extends to within bout two feet of the final nozzle. After the last rotor tage air is bled off internally and is taken through umels in two of the ribs in the casting to cool the upstream face of the turbine disk.

More air is taken through three tunnels in the central casting into the space between the two plate diaphragms in front of the turbine disk. Most of this air then passes into the hollow turbine nozzle guide vanes, emerging through slits in the trailing-edges.

COMBUSTION CHAMBERS-There are six chambers disposed radially around the central casting carrying the rear compressor bearing and the turbine shaft bearing. They are numbered one to six from the rear. No. 1 being horizontal on the left. Spark plugs for initial combustion are in chambers one, three, and five. Interconnectors are provided between the combustion chambers. A fuel injector in each chamber injects fuel upstream. Swirl vanes are fitted to the forward end of each chamber, with baffles at the rear, the hot gases passing through "slot mixers" formed in

#### Propelled Airplanes in Design Stage, Experimental Development and in Production—continued on next page

#### ocke-Wulf Ta 183—Fighter (Kurt Tank, designer)

Power plant—Jumo 004 or He S 011 turbo-jet unit nounted at rear of fuselage. Max. speed-590 mph; endurance-up to 3 hr.

#### cke-Wulf Ta 400—Bomber (design stage)

Power plant-Four piston-type engines and two Jumo % turbo-jet units.

Span-137.8 ft; Length-92.4 ft; max. speed-450 mph;
max. bomb load-22,000 lb; max. range-3000 miles.

#### einkel He 162A—Fighter

Power plant—BMW 003 E-1 turbo-jet unit, or Jumo 004, Helnkel-Hirth 011, BMW 003 E-2 turbo-jet unit.
Fuel capacity—208 imp. gal S-2 fuel.
Span—23.65 ft; wing area—120 sq ft; aspect ratio—4.65 ol; over-all length—29.71 ft.
Weight—5940 lb (gross) and 5480 lb (normal).
Max. speed—522 mph at 19,700 ft; rate of climb (normal reight)—4200 fpm (sea level); 2460 fpm (19,700 ft).
Full throttle range (max. fuel)—242 miles (sea level); 35 miles (36,000 ft).

miles (36,000 ft).

willes (36,000 ft).
Full throttle endurance (max. fuel)—30 min. (sea level);
min. (36,000 ft).
Ceiling (normal weight)—39,400 ft; take-off run (gross
Fight)—2625 ft, with ATO units 1240 ft; landing speed—
mmh.

#### leinkel He 178

The He 178 was test-flown at the end of August, 1939. Thus it was the first jet-propelled aircraft to fly. It was shoulder wing monoplane and had a large diameter He-S3 tribo-jet unit in the fuselage. Strictly an experimental the and not designed for military purposes.

#### Heinkel He 280

Power plant-Two He-S8 turbo-jet units, later two BMW 003A units. Span—39.3 ft; length—34.1 ft; take-off weight—9550 lb. Development abandoned in 1944.

#### Heinkel He 343

Projected four-jet monoplane, development of which was

#### Henschel Hs 132-Dive bomber

Power plant—One Jumo 004 jet unit. Span—40 ft; max. bomb load—3300 lb; max. speed (no bombs)—495 mph at 3000 ft.

#### Junkers 8-263 (Ju 248, development of Me 163B)

Power plant—One Walter 109,509C rocket unit. Fuel capacity—352 Imp. gal. T Stoff and 185 Imp. gal. C

Span—31.2 ft; length—26 ft; wing area—191.5 sq ft (net); max. speed—590 mph; endurance—15 min at 36,000 ft and 435 mph; time of climb—3 min to 49,000 ft.

#### Junkers Ju 287—Heavy bomber (prototype stage)

Junkers Ju 287—Heavy bomber (prototype stage)
First heavy jet-propelled bomber ever to fly.
Power plant—Ultimately the Ju 287 would have been
propelled by two large turbo-jet units made by BMW or
Junkers and each developing a static thrust of 5500-7000 lb.
As these units were not ready various arrangements of four
or six smaller units were tried. With six BMW 003A-1
units, the following are representative data for the Ju 287:
Span—66 ft; length—60 ft; wing area—628 sq ft; normal
gross weight—47,500 lb; max. bomb load—9900 lb; range
with 6600 lb bomb load—1175 miles; max. speed—509 mph
(sea level); 537 mph (16,400 ft).
(Next page, please)

the rear side wall. The hot gases then mix with the cold air which by-passes the combustion chambers. The chambers are built up from aluminized mild steel sheet and the combustion chamber housings are free to slide at the forward end, to move for expansion.

TURBINE—There are 61 turbine blades, fixed into the disk by a forked blade root and secured in position by rivets. Later, to economize in material and to permit higher operating temperatures to be used, hollow turbine blades were employed. The hollow blades are placed on lugs formed in the periphery of the disk and fixed by a special soldering process, as well as a 5 mm peg. Cooling air is directed inside the blades. The blades are manufactured from heat-resisting steel containing 30 per cent nickel, 15 per cent chromium.

TAIL PIPE—Mounted in the tail pipe is a movable "bullet" operated by a servo-motor through the throttle lever. A rack-and-pinion device moves it longitudinally. On the ground the bullet is fully forward under 50 per cent of max rpm and fully back (restricted orifice) between 50 per cent and 90 per cent of max rpm. At the beginning of take-off the bullet is near the end of its backward travel, but in flight, above 20,000 ft and at a speed of 400 mph, the bullet can be moved even farther back to provide maximum thrust. The servo motor-control is interlinked with a capsule surrounded by atmospheric pressure and having ram pressure inside it, so that the position of the bullet is adjusted according to the ram pressure or the forward speed.

The rear portion of the tail pipe has a double skin, and air passing over the nacelle is directed into it for cooling purposes.

LUBRICATION—Oil is carried in an annual nose tank. There are two pressure pumps, one supplying oil to the rpm regulator, oil servo-motor, and compressor front bearing. The second pump supplies oil to the rear compressor bearing and the two turbine rotor bearings. These three bearings are enclosed in an oil-tight case and a jet sprays oil into the interior of the splined shaft between the compressor and turbine shaft.

Two scavenge pumps remove oil from the rear of the bearing casing and the rear turbine rotor bearing and return it to the tank. Oil from the front of the casing drains into the bottom of the auxiliary drive casing from whence it is removed to the tank by a scavenge pump.

AUXILIARIES—An auxiliary drive casing is arranged above, and driven from the front compressor shaft. From this casing are driven the fuel injection pump, the rpm governor, and the pump for the thrust regulator and bullet servo-motor.

STARTING SYSTEM—A Riedel two-cylinder twostroke starter engine is mounted in the air intake coaxially with the compressor shaft. It can be started electrically from the cockpit or by hand by means of a cable and pulley.

Riedel engine data are: Power 10 hp. Max rpm 10,000. Bore 70 mm. Stroke 35 mm. Weight 16.5

#### Specifications of German Je

FF 12

at. si

iers on mit in

Design

Powe

Fuel

rma]

lus 66

HI

sion

of 19

meno

early

1940

of 19

110,

were

004

seve

end

type

prod

but

T

the

syst

is 6

sum

leng

colla

Jun

A

was pelle

P

BM

in :

Oct

#### Miscellaneous Junkers Projects

Mistel 5 composite aircraft—A projected Junkers composite, the upper component of which was to be the He is single-jet fighter. The lower component carrying the was head and designated Ju 268 was to be a mid-wing monopla of wood construction having twin fins and rudders and jettisonable tricycle landing gear. The power units we two BMW 003 turbo jets. The max speed was to be on 500 mph.

EF 126 ground-attack aircraft—A projected Junker

EF 126 ground-attack aircraft—A projected Junks single-seat mid-wing monoplane of composite constructs with a single Argus-Rohr propulsive duct having a selevel static thrust of 1100 lb. Span 20.8 ft; wing area seq ft. Total flying weight 6160 lb. Max. speed at sea level 480 mph.

480 mph.
Flying wing project—A projected Junkers flying win
type, with stabilizing fins and rudders mounted on a
trailing-edge of the wing. The wing is of wood and a
fuselage of metal. The power plant consists of four
junits mounted centrally at the rear. Retractable trick
landing gear. Span 78.8 ft; aspect ratio 4.8; wing are
1290 sq ft; gross weight 77,000-84,000 lb; design speed 6
mph. Design range 3700 miles.

kg. Capacity 270 cu-cms. Fuel for the starter moto is contained in a tank of three liters capacity mounte in the nose, forward of the oil tank. Starter fuel for the turbo-jet unit is contained in a semi-circular tank mounted forward of the oil tank. The starter fuel is gasoline.

INSTALLATION AND INSTRUMENTS — The complete turbo-jet unit is fixed at three pick-up points two above the rear compressor bearing, and one above the combustion chamber housing. All pipe lines are electrical connections are brought to a small pane above the compressor casing, in order to simplify the installation procedure.

The aircraft instrument panel contains an injection pressure gage, an rpm indicator, an exhaust gas temperature gage, an exhaust gas pressure gage, and as oil pressure gage. The rpm indicator has an inner and outer scale, the inner scale reading from 0 to 3000 rpm, being used during starting, and the outer scale reading from 2000 to 14,000 rpm, being used during flight. The exhaust gas pressure gage is connected to both the tail pipe and the compressor intake.

#### OTHER TYPES-

004 C—improved 004 B with increased thrus and auxiliary fuel injection.

004 D-4—004 B with new regulator, which prevents too rapid throttle movement, and two-stage fuel injection.

004 E-004 D-4 with shorter tail pipe.

#### Performance Data for 004 B Unit

	i cryormance bu	,0. 001	Fuel
Height	Speed	Thrust	Consumption
(ft) 0 0	(mph) 273 560	(Ib) 1605 1890	(lb/hr) 2920 3680
8,200 8,200 36,000	273 560 336	1300 1600 572	2290 2920 1080
36,000 Max. rpm 870	560	715	1275

Max. rpm 8700 Length 3864.5 mm (with movable bullet). Bullet projects 200 maximum

### n Je Propelled Airplanes—continued from preceding pages

pF 128 jet-propelled fighter—A projected Junkers single-gat, single-jet, shoulder-wing monoplane of the tailless ype. Sharply swept-back wings. Stabilizing fins and rud-lers on trailing-edge of wing. Tricycle landing gear. Jet mit in fuselage. Span 30.2 ft. Total flying weight 10,780 lb. Designed max. speed at 19,700 ft, 590 mph.

suerschmitt Me 163B-Interceptor fighter

ers and nits we be ow Power plant—One Walter 109.509 bi-fuel liquid rocket. Fuel capacity—226 Imp. gal. T Stoff, 110 Imp. gal. C Stoff. pan-30.6 ft; wing area—186 sq ft (net); length—19.4 ft.; sormal weight—9500 lb; max. speed—550 mph at 20,000 ft; dimb—2.6 min to 30,000 ft. Junke struction g a sea area fi sea lev

Messerschmitt Me 163C

ers con ne He i the was

fuel i

- The

points

e abov

during nnecte

thrus

ch pre

ent, and

Fuel

sumpti

(b/hr)

2920 3680 2290

2920

1275

s 200 mm

USTRIE

9

ing wind on the and the four jet tricydring are speed 6 Power plant—One Walter 109.509C rocket unit with an utiliary cruising jet, smaller than main jet, positioned immediately below it in the tail. Total thrust is 3740 lb plus 660 lb. Span—32.2 ft; net wing area—197 sq ft; length—23.1 ft. Take-off weight—11,280 lb; max speed—590 mph between 1,100 and 35,300 ft; ceiling—52,500 ft; endurance—12 min.

Messerschmitt Me 262A-Fighter, bomber, etc.

Power plant—Two Jumo 004B turbo-jet units (528 Imp. gal, J-2 Diesel oil fuel).

gal, J-2 Diesel oil fuel).

Span—41 ft; wing area—234 sq ft; height—12.6 ft; track—
8.3 ft; take-off weight—15,550 lb; max. speed—525 mph at
23,000 ft; service ceiling—39,400 ft (11,450 lb weight); climb—11 min. to 26.300 ft; take-off run—3270 ft without
ATO, 1965 ft with ATO.

Messerschmitt Me 328 (project abandoned)

Power plant—Two As 014 propulsive ducts; later one Jumo 004 B-2 turbo-jet unit.

German Helicopter

An interesting development is a helicopter with a jetactuated rotor on which experimental work was being carried out in Austria. The aircraft has a gross weight of 1400 lb. A 135 hp engine drives an ordinary centrifugal supercharger which delivers a fuel vapour mixture through the hollow rotor blades to burners at the tips. The burnt gas is ejected through tangential nozzles causing the rotor blades to rotate by reaction.

Max. diameter (intake cowling) 805.6 mm

r moto Weight 1585 lb + 3 per cent

nounte

Rel-Diesel oil (J-2. Specific weight 0.815 — 0.845 kg/liter or

K-1. Specific weight 0.81 — 0.85 kg/liter)

fuel for the specific weight 1540 lb + 3 per cent

MD-4-Thrust 2020 lb sea level. Weight 1540 lb + 3 per cent ar tan M E-Similar to 004 D-4

HISTORY-Some preliminary work on jet propulsion was carried out by Junkers in 1937. At the end of 1939 the designing of a full scale turbo-jet was commenced. Construction of the Jumo 004 A was begun early in 1940 and the first unit was run in December, nes and 1940. Several 004 A units were ready in the summer 1 pane of 1941. First flight tests were made, using an Me lify the 110, at the end of 1941, and soon afterwards the units were installed in experimental aircraft. The Jumo njection 004 B was designed at the end of 1941; this embodied as tem several modifications. The first 004 B unit ran at the and at end of 1942, and in the early summer of 1943 a proton innet type Me 262 was flown with these units. Large scale to 3000 production was planned to start in the summer of 1943, r scale but was not fully achieved until May or June 1944.

#### Junkers Jumo 012 Turbo-Jet Unit

This projected unit was intended for a fast bomber, the Ju. 287. It had an eleven-stage axial compressor system and a two-stage turbine. The design thrust is 6400 lb and the weight 4400 lb. The specific consumption was expected to be 1.2 lb/hr/lb and the length was about 17 ft. Up to the time of the German collapse no unit or component had been tested.

#### Junkers Jumo 022 Turbo-Jet Unit with Propeller

A unit designated as Jumo 022 was projected; this was a 012 unit with gearing for contra-rotating pro-

#### BMW 003 Turbo-Jet Unit

Preliminary work on jet propulsion was started by BMW in 1934 and work on the BMW 003 project began in 1939. The unit first ran in August, 1940. The

BMW 003 has a seven-stage axial compressor and an annular combustion chamber with 16 burners. The single-stage turbine had hollow air-cooled stator and rotor blades. The adjustable propelling nozzle has internal cooling.

#### Data for BMW 003 A-1

Overall length		3534 mm
Max diameter		690 mm
Weight		1252 lb
Static thrust		1760 lb
Consumption		2550 lb/hr
Thrust (sea-level, 560 1	mph)	1550 lb
Consumption		3240 lb/hr
Rotational speed		9500 rpm
Fuel		B.4 (87 octane)

#### BMW 018 Turbo-Jet Unit

This unit was projected but not completed. It has a twelve-stage axial compressor, an annular combustion chamber with 24 burners, three-stage turbine and an adjustable propelling nozzle. A static thrust of 7500 lb was hoped for.

#### BMW 028 Turbo-Jet Unit (with Propeller)

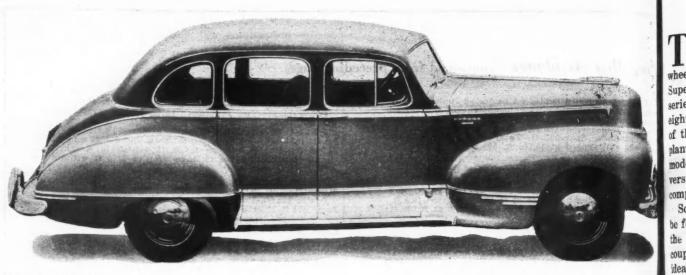
This unit was projected as a BMW 018 unit modified to drive contra-rotating propellers. An additional turbine stage was added and the drive to the propellers taken through the main compressor shaft and transmitted through planet gears. Performance data follow:

> Hp delivered to propeller ... 7,700

#### Ernst. Heinkel Aktinegesellschaft Werk Hirth-Notoren Heinkel-Hirth He S 011 Turbo-Jet Unit

The Heinkel Hirth He S 011 was the outcome of development work on the He S 11. It has an impeller at the intake; a compressor consisting of a diagonal

(Turn to page 88, please)



Side view of 1946 Commodore Six with new belt moldings, hood ornament and longer bumpers extending around the sides.

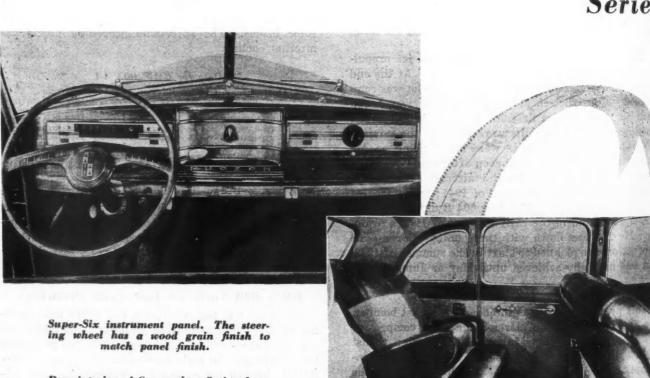
# Hudson to Build Supera

Series of

eigh of th plan mod vers com] So be f

cour idea

trib rece tota



Rear interior of Commodore Series show-ing extensive use of leather.



AUTOMOTIVE and AVIATION INDUSTRIES

0

THE 1946 Hudson cars will be produced on one wheelbase—121 in.—and in two "style" lines—a Super Series and a Commodore Series. Each of these series will be available with both six-cylinder and eight-cylinder engines, the corresponding body models of the same series being identical except for power plant and price. Production started with six-cylinder models only, the Eights following as soon as reconversion of eight-cylinder engine machinery can be completed.

Scheduled for first delivery are four-door sedans, to be followed by broughams and club coupes. Later, as the most urgent demand is met, three-passenger coupes and convertibles will be added to the line. Some idea of the scope of Hudson's manufacturing and distribution plans is given by the fact that the company recently entered the market for additional materials totaling 40 million dollars in value.

Chief appearance change in the 1946 Hudsons is an entirely new front end design, the over-all features of which are shared by both the Super and Commodore Series. In the center, at head-lamp level, is a newly designed adaptation of the Hudson Triangle emblem, mounted on a heavy cross bar which tops the grill, and indirectly lighted from the rear. The grill is much heavier than in previous designs and is cast instead of stamped. Sealed-beam head lamps are of oval design, each carrying the Hudson emblem at the bottom.

On Commodore models, bumpers are longer and extend around the side. Extra guards are set near the ends of the front bumper on these models.

The plastic hood ornament on all models is of entirely new design, and is set well back. Streamlining appearance of all models has been greatly improved by new belt moldings of bright metal, which run the length of the car and curve down at the rear. This feature is particularly well adapted to two-tone painting, which has been reversed in 1946 models, with

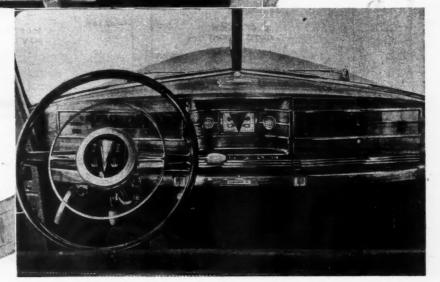
the dark color above and the light color below.

Commodore models for 1946 carry an auxiliary belt molding which extends the entire length of the body, with plastic Hudson Triangle emblems at (Turn to page 100, please)



Front end design of 1946 Super-Six. In addition the Commodore car has an auxiliary belt molding, front fender lamps, and an extra set of guards on the front bumper.

The grained finish instrument panel dominates the front interior of the Commodore Six.



# Design Features of the

The Douglas C-74 Globemaster, as the military cargo version of the DC-7 airplane, was designed to haul huge cargoes of military equipment and supplies, including jeeps, small tanks and trucks, howitzers, pursuit airplanes, etc. At a moment's notice it can be quickly converted into a troop transport with a capacity of 125 fully equipped troops or a hospital ship with 115 litters.

The Globemaster is equipped with its own cargo loading elevator operated by two traveling cranes supported on overhead rails in the roof of the cargo cabin. A swinging stationary hoist, located at the lambda cargo door forward, provides additional quick loading facilities.

The C-74's useful load is more than 30 tons. With a full fuel load the C-74 will fly non-stop more than 7500 miles. Its maximum speed is in excess of 300 mph.

While the C-74 is the military cargo version of the DC-7, yet the peacetime version of the DC-7 is somewhat different than the Army cargo plane. For instance, the C-74 has a gross weight of 155,000 lb, while the DC-7 will gross 162,000 lb. The DC-7 will carry 108 passengers and a crew of 13 and will have two spacious cabins, one accommodating 72 passengers and the other 36, a modern galley for serving full-

course meals aloft, dressing rooms and cargo compartments.

#### Design of the Fuselage

The fuselage is circular in section with a maximum outside diameter of 13 ft 2 in. The structure is semi-monocoque construction, utilizing hat section stringers with zee and channel section transverse frames. Flush rivets on the outside surface are used throughout.

of e

encl

gen

par

ope

are

par

of a

and

Ca

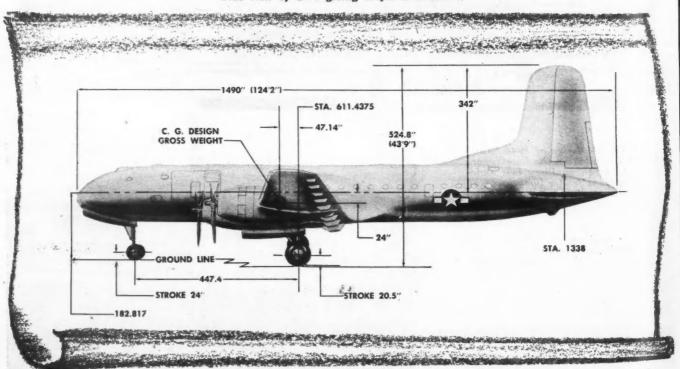
Fu Oil Ma i Be i Tr Li

0

The fuselage is divided into five principal areas—pilots' compartment, crew's compartment, relief crew's compartment, main cabin, and lower cargo compartments. Floor levels are arranged to provide maximum utilization of space. Access is provided between compartments by means of doors in the bulkheads and dcors in the floors. Access is also provided to mechanical controls, landing gear and other equipment located under and in front of the pilots' compartment by means of a door in the crew compartment floor.

The pilots' compartment has seats for pilot and copilot. Vision to the outside is through two enclosures of the blister "bug eye" type. Each enclosure was designed to withstand bird impact. The windshields are kept clear by heat de-icing and windshield wipers. A clear vision panel triangle window which can be opened and closed is installed on the outboard side

Side view of C-74 giving major dimensions.



# Douglas C-74 Transport

Cargo Loading Equipment Includes Elevator, Two Traveling Cranes and Swinging Stationary Hoist

of each windshield. The center portion of the pilots' enclosure can be jettisoned in order to furnish emergency exit from the pilots' compartment.

On the flight deck, directly aft of the pilots' compartment, are stationed the flight, engineer, radio operator and navigator. A galley and crew's lavatory are also located here. Access to the relief crew compartment is through a hatch in the floor by means of a ladder connecting the two compartments. There is a window at each station. The flight engineer and navigator windows are of the blister type to per-

mit vision all around on each side of the airplane. The navigator's dome in the roof of his compartment is an auxiliary exit and entrance.

The relief crew compartment is located beneath the flight deck and has sleeping accommodations for six crew members with a window on each side. One of the windows is also an auxiliary exit, operatable

#### C-74 Specifications

argo

num

emi-

gers

lush

t.

as-

ew's

art-

num

om-

and

meient

coires was elds ers. be

Dimens	i	C	1	11	8											
Span															173	ft-3 in.
Length															124	ft-11/2 in.
Height															43	ft-9 in.
Tread															34	ft-2 in.

Tread					٠.	•			679	4	ft-2 in.
Capacity:											
Fuel capacity	,										11,000 gal
Oil canacity											340 gal

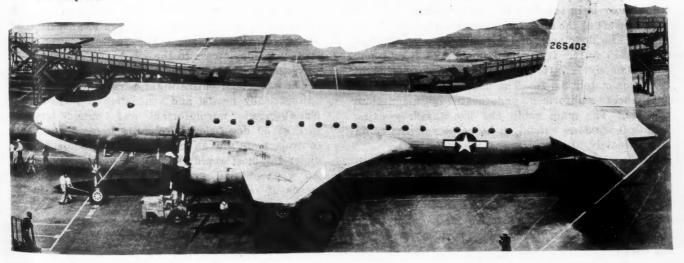
Main cargo compartment capac-
ity 6500 cu ft
Belly cargo compartment capac-
ity 615 cu ft
Troop capacity 125
Litter capacity 115

Weights:
Overload gross weight .......155,000 lb

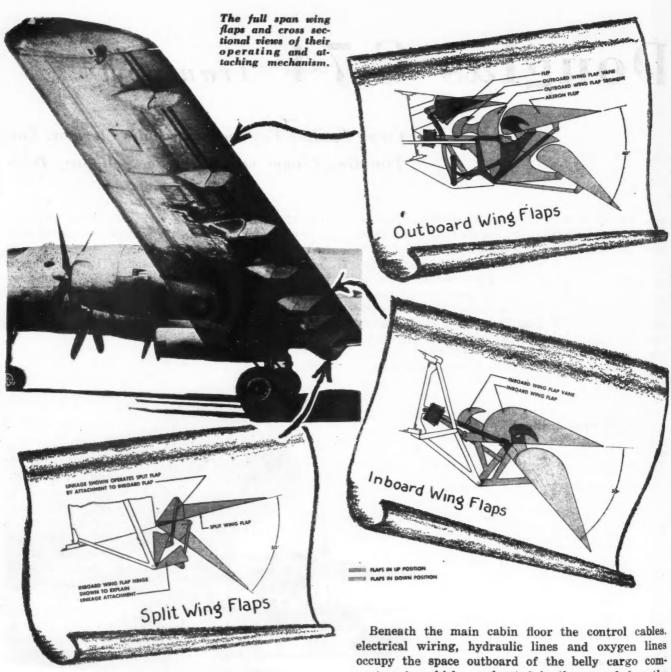
Exterior views of the C-74 Globemaster. Two "bug eye" enclosures are provided for the pilot

and co-pilot.





RIES



from inside and outside the airplane. The crew entrance door is in the floor of this compartment.

A door aft of the crew compartment enters the main cabin. The floor area of the main cabin is approximately 875 sq ft. It is approximately 75 ft long and approximately 11.7 ft wide. Maximum usable height is approximately 8.5 ft. The floor is 0.072 in. aluminum sheet, reinformed underneath by magnesium I-beams. The main cabin has five auxiliary exits. Elliptical windows extend on both sides of the cabin approximately 40 in. apart.

Cargo may be loaded through a side loading cargo door in the forward area of the main cabin and through a bottom loading well immediately aft of the wing. Cargo tie-down rings are arranged in a 20 in. grid pattern, covering the entire main cabin floor. Heavy-duty tie-down fittings are provided for securing cargo.

Beneath the main cabin floor the control cables. electrical wiring, hydraulic lines and oxygen lines occupy the space outboard of the belly cargo compartments, which are located in the area below the floor support beams. These compartments are accessible from the main cabin through doors in the floor. The forward lower cargo space is also accessible from the outside through two doors located near the bottom of the airplane. The forward lower cargo space provides access to the wing nose crawlway and to the relief crew compartment.

The cabin and entire flight personnel quarters are automatically heated and ventilated so that the airplane's interior is comfortable at an outside temperature of 50 deg below zero. Electronic temperature controls maintain an even temperature distribution under the most rapid changes in weather conditions. All wing and tail surfaces are thermally de-iced by means of remotely controlled heaters located in the wings and tail. The airplane is equipped with an oxygen system, providing outlets for all crew members as well as the 125 troops or 115 litter patients for long duration high altitude flights.



Looking aft in the cargo cabin. Note in the roof the two rails and cranes at the rear, also the overhead heating and ventilating duct in the center of the roof. The outline of the elevator can be seen in the floor.

Using the elevator to hoist a jeep into the cabin.

#### Cargo Hoists

les.

nes

the

the ible the

rgo and

are

ir-

raure
ion
ns.
by
the
an
mnts

IES

The C-74 is equipped with hoisting facilities for loading and unloading its own huge cargo. The loading equipment comprises (1) two traveling cranes which are supported on overhead rails in the roof of the fuselage and which can be operated together or independently, and (2) a stationary hoist, located forward at the cargo loading door on the left side of the cargo cabin.

The freight elevator is a section of the main cabin floor which can be lowered to the ground and raised by the traveling crane equipment. When not in use, the elevator is secured in place by a releasable latch mechanism and becomes a part of the cargo cabin

floor. The two traveling cranes operate the elevator, swing cargo in and out of the airplane through the belly of the huge transport and then distribute the cargo inside the cabin by operating back and forth on the overhead rails.

The overhead rails extend approximately 50 ft along the length of the cabin so that the load can be placed exactly where it is to be stowed before it is lowered

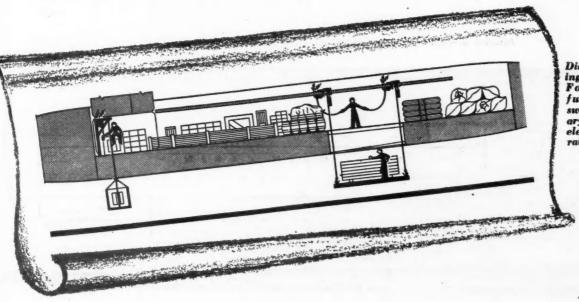


Diagram of loading equipment. Forward in the fuselage is the swinging stationary hoist and the elevator is being raised by the two cranes.

Empennage de-icing equipment.

De-icing air distributing duct
-De-icing air outlet to double skin
-Main cabin duct
-Ceiling outlet (anemostat)
-Cabin heating air shut-off valve
-Electric motor and valve actuator
-Exhaust outlets
-Combustion air duct
-Ram air shut-off valves
(for blower operation)
-De-icing air supply outlet -De-icing air supply outlet -Combustion air scoop

12-Heating and ventilating air scoop

-Header -Heaters

Automatic temperature control valve

-Ignition box 16-

17-Blower

Blower air supply duct De-icing air supply outlet (R. H. outlet the same as L. H. shown)

Emergency manual override control (cabin heating shut-off)

to the floor. The traveling cranes will each noist 8000 lb or a total of 16,000 lb when used together.

These cranes are also used to lower and raise the airplane's engines when a quick engine change is necessary. A truss type hoisting frame, which can be mounted on the nacelles, was specifically designed for this purpose. A cable from one of the cranes can be routed from the fuselage out over the wings to the hoisting frame and the engines raised or lowered to their proper place.

The side door hoist, installed near the forward end of this side cargo door, can be rotated so that its boom can be swung outboard and a load lifted from the ground to the level of the cargo floor and deposited inside the airplane. This side cargo door hoist will lift 4500 lb.

All the hoists can be used with single or double hoisting lines, and the adjustments necessary for the purpose can be made without the use of tools. The side door hoist is

built so that its boom can be raised or lowered to accommodate cargo items of varied dimensions. That also can be done without special tools. The power available is sufficient to make possible the hoisting of maximum loads from the ground to cabin floor level in 1½ min. All hoist units include mechanisms for hoisting loads manually in the event of power failure. Manual winches are so designed that maximum loads may be hoisted in 15 min. The main winches for all hoists are protected from overload conditions by

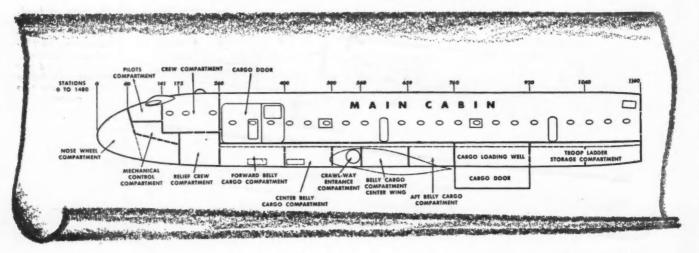
(20)

clutch installations. The door cargo hoist is so located that it can be used for changing the locations of cargo items by using its hoisting cable as a drag line.

All hoist units are operated from electrical units which are powered from the electrical system of the airplane. The hoists have push button control with automatic braking built into the power units.

The C-74, with its self-loading equipment can load, stow and haul 10 R-3350 Engines and cradles; or 15 (Turn to page 58, please)

Interior arrangement diagram showing main fuselage compartments.



### German Jet Planes

(See page 18 for description of German jet propulsion engines and planes)

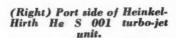
British Combine photos

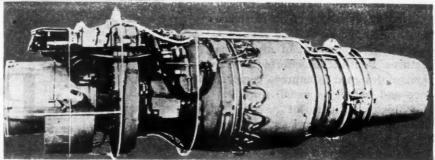
(Right) The Me 163B intercepter fighter powered by a Walter 109.509 liquid rocket unit. The retractable landing skid can be seen under the fuselage.

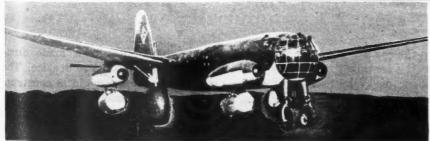




(Left) This Me 262A fighter has two Jumo 004 turbo-jet units.

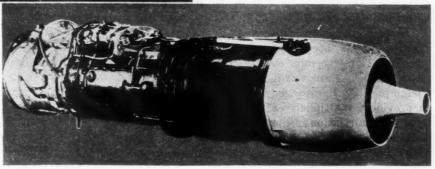


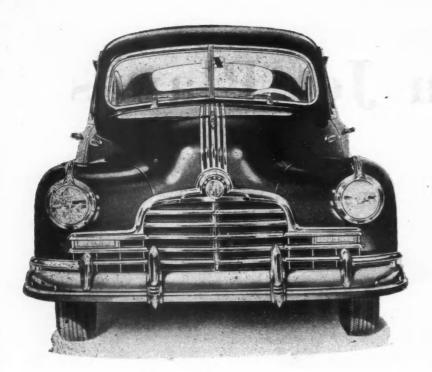




(Left) Junkers prototype fitted with four Jumo 004 turbo-jet units. Assisted takeoff units are suspended beneath the jet units. The final design called for a retractable undercarriage; the one on this plane is fixed type.

(Right) Port side of BMW 003 turbo jet unit.





A newly designed grille, relocated parking lamps and heavier bumper are the major front end changes on the 1946 Pontiac.

interio bellish

of clo

plated

be ma

stain

stamp

platin

call f

Wi

fies 5

used

prove

fiddle

panel

pane

this

instr

mou

back

D

Ch

THE initial manufacturing program of Pontiac for 1946 marks the release of one line—the Streamliner Model on 122 in. wheelbase with either the six- or eight-cylinder engine, with one body style—the two-door sedan. Engine specifications remain the same—Six: 6-cylinder, L-head, 3 9/16 in. bore by 4 in. stroke, 239.2 cu in. displacement, rated 90 hp at 3200 rpm. The Eight: 8-cylinder, L-head, 3¼ in. bore by 3¾ in. stroke, 248.9 cu in. displacement, rated 103 hp at 3500 rpm.

From the standpoint of mechanical features, Pontiac has effected certain changes designed to improve performance and based, as usual, upon service history. Some of the major changes of this character are presented below.

In 1942, the Six was fitted with a  $9\frac{1}{8}$  in. Inland single disc clutch. For 1946 both the Six and Eight will have the same  $9\frac{1}{2}$  in. clutch.

Formerly the intake manifold gallery on the Six was made parallel with the crankshaft. Now the casting has been changed so as to make the gallery parallel with the ground. This should be of particular interest to dealers and service men. The life of the muffler is expected to be increased with the adoption of heavier stock, terne plated. Tail pipes are coated both inside and out with aluminum for longer life.

The criginal mechanical control of metering of the carburctor has been changed to a combination of mechanical and vacuum control to provide a slightly richer fuel mixture during acceleration under load. Piston pins are shot peened before grinding, primarily to provide a multiplicity of tiny oil pockets offering improved lubrication in the bushings. The accelerator pedal has been modified by the adoption of an all-steel hinge instead of the ball-and-socket pivot formerly

used. It is claimed this gives a feeling of greater stability.

The water distribution tube for the valves now is made of brass instead of coated steel to increase life. Exhaust valve guides have deeper counterbores at the upper end to afford still more clearance for the valve stem and to eliminate valve sticking under continuous low speed driving.

The water pump slinger has been changed to increase the life of the pump shaft. To this end the sleeve portion of the slinger has been lengthened so that it covers the entire shaft from the impeller forward to the slinger flange.

In the electrical system, the horn wire is encased in loom in the area where it fits in the steering column so as to prevent the possibility of shorting.

# Pontiac

The headlight dimmer switch has been made dustproof to assure freedom from trouble in service. The battery retainer is heavier and more rigid in construction and is given two coats of enamel to prevent corrosion.

Adoption of the new type of radiator grills is said to improve cooling and enables the cooling system to operate some nine to ten degrees cooler. The grille is a composite unit made up of chromium-plated steel stampings, chromium plated. Incidentally, chromium principally for the front ornament and mounting and the vertical spacer bars.

Improvements have been made in the details of body construction. For example, the sills, doors, and underbody are given a corrosion-resistance treatment to prevent corrosion in service. Rubber weatherstripping is firmly retained by the use of a larger number

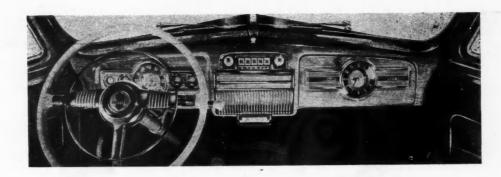
The instrument panel, which has a new radio speaker gille at the center, and other interior metal panels are embellished with a fiddleback walnut finish.

of closely-spaced clips. All plated steel moldings will be made either of polished stainless steel or of brass

stampings, chromium plated. Incidentally, chromium plating specifications—when they become effective—call for a heavier and more durable coating.

With the adoption of synthetic tires, Pontiac specifies 5 in. rims instead of the  $4\frac{1}{2}$  in. rims formerly used with the 16 x 6.50 in. tires. This is said to improve stability and to reduce power loss materially.

Chromium-plated hardware replaces plastics and fiddleback walnut finish has been chosen for the metal panels, including the embossed instrument control panel. A newly designed radio speaker grille centers this panel, flanked on the left by the chrome-trimmed instrument group and on the right by a matching clock mounting plate. Embossed metal trim panels, in fiddleback walnut, extend from the windshield to rear seat



in an unbroken sweep. These panels have a polished chrome bead molding extending full length. Along their lower edge is a 0.75 in. wide polished escutcheon plate.

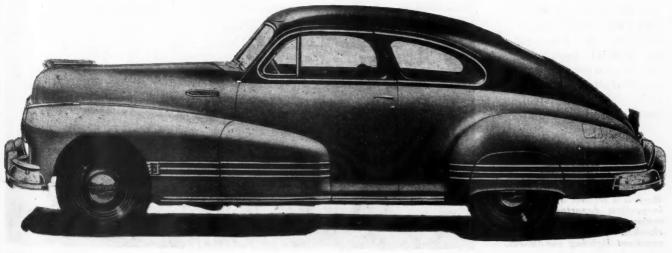
Door panels are trimmed in solid neutral tone fabric with a wide shadow panel below and parallel to the door trim panels. These shadow panels are created by creases at right angles producing narrow shadow lines. Wide chrome molding extends across the door directly above the scuff pads.

Seat backs are upholstered in fabrics in plain pillow panel style, while seat cushions are covered with the same material.

Colors presently available are black, maroon, blue, gray, snicked pearl, two-tone gray and two-tone biue.

### Production Starts with Streamliner Two-Door Sedan, Incorporating Numerous Appearance and Mechanical Changes

The 1946 Pontiae Streamliner twodoor sedan.



October 1, 1945

Several types of parts and joints produced by Tourek,

E

prin

Typ Typ

sp

typ

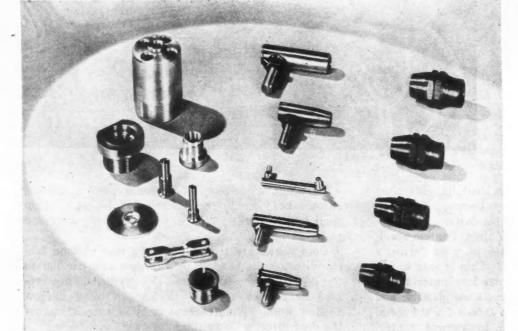
are

int

ap

tio

sta



ByJoseph Geschelin

LAIMING the distinction of being the largest producer of ball joint assemblies for spark and throttle controls, J. J. Tourek, Chicago, has been identified as an automotive parts producer for 25 years. The company has confined its activity to specialization in screw machine parts. And in keeping with this activity they operate an excellent screw machine plant with complete self-contained facilities for product design and tool engineering which are at the service of anyone interested in the manufacture of special products. For the postwar market the company is embarking on the following lines:

1. Ball Joints-for spark and throttle controls and governor controls for passenger cars, trucks, buses, industrial engines, and

aircraft.

A new line of high pressure fittings suitable for fuel and oil lines, particularly for Diesel engines; for hydraulic systems; and for refrigeration systems.

3. Continuation of its specialized screw machine contract service to the industry.

The Tourek line of

This is the 110th in the series of monthly production features

num, etc. The standard catalog line includes the following types:

Type A-spring type non-adjustable, in four sizes

Type AS-spring type non-adjustable, in three sizes

Type B-spring type adjustable, in five sizes

Type C-without spring, adjustable, in five sizes from 1/4 to 1/4 in.

Type D-bent type swivel, in four sizes

Type DD-double bent type swivel, in two sizes

Type DS-straight type swivel, in four sizes

Type E-straight type swivel, in four sizes

ball joints comprises a wide assortment of types and sizes suitable for the needs of gasoline and Diesel engine builders, in standard and special types, and in any specified kind of material such as carbon steel, stainless steel. brass, bronze, alumi-



Here is a section of the final inspection department. The inspection department. various parts are carefully checked for quality under excellent lighting conditions.

# **Emphasis on Interchangeable Tooling** and Cutting Fluids at Tourek Plant

Looking down one of the principal bays of the plant multiple spindle screw machines predominate here.

Type L-one-piece swivel joint, in three sizes Type M-midget joint, in five sizes up to ¼ in.

Type MM—midget double-end joint in one size

Of course, various special and unique types of ball joints also are designed for very intricate hook-ups or applications or installations where required.

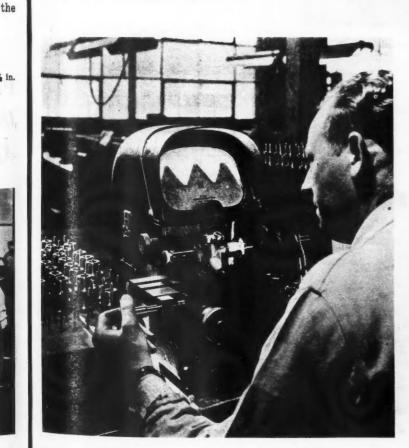
Considering the variations in product made by this organization, it is obvious that flexibility is an outstanding characteristic. This is exemplified in the nature of the equipment, the arrangement of the

plant, and the technique of production scheduling that is employed. Interchangeable tooling for the various machine tools permits the operation of long runs for maximum economy. At the same time, it is

feasible to interrupt long runs to accommodate emergency jobs without upsetting the schedule.

The layout of the plant is designed along simple functional lines to facilitate flexibility. For example, one long bay is devoted entirely to single spindle automatics, including Brown & Sharpe No. 00, No. 2, No. 4, and No. 6 machines. The second bay features large multiple-spindle automatics, principally a battery of four- and six-spindle Greenlee machines of 15% in. and 25% in. capacity. The third main bay is devoted to small multiple-spindle automatics, principally National Acme four-spindle machines.

These main bays encompass the primary machine lines which complete the major operations on any piece in a single setting. Secondary operations are handled on other equipment in the interest of maximum economy. For this purpose they have a battery of turret lathes including Warner & Swasey and Bardons & Oliver machines, Landis bolt threaders, and others. Milling opera-

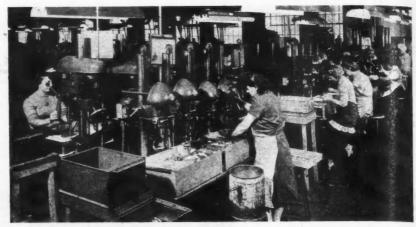


Small edition of the versatile J & L Comparator is used for the inspection of threads and special forms.

tions are handled on hand mills, a group of Sundstrand automatic milling machines and several Cincinnati and Brown & Sharpe milling machines.

Drilling and tapping operations are routed to a department provided with a battery of the familiar Delta drill heads and a group of vertical Haskins sensitive tapping machines. A variety of finishing and polishing operations is handled in the polishing and grinding department and on a burring bench.

Supplementing the metal cutting department is a punch press line



This department handles the sensitive drilling and tapping operations. In the foreground are the Delta drill presses, in the background are located some of the Haskins tapping machines.



Close-up of the work station of one of the Greenlee multiple spindle screw machines used by Tourek.

designed to speed secondary operations. As the parts come off the primary machine lines, instead of routing to the secondary operations, they are picked off and stored in a special stock room designated as a clearing house. From here, the rush jobs are delivered directly to a secondary machine as required, at the right time. Conn

P&W

mack

pany

into

avai

eter.

nat ula Eit car

rep

vic

wh

lat

lat

me

st

0

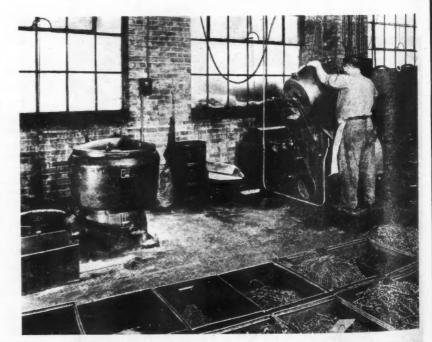
Although cutting fluids are recognized as being a vital element in the economical operation of a screw machine shop, at Tourek their role has been given special emphasis not only for reasons of economy but for

(Turn to page 56, please)

equipped with small inclinable presses tooled for a variety of operations. They are used for making small stampings, for crimping and assembly of ball joints, for shearing, and for removing large burrs and centers.

To assure uninterrupted service, the company has its own tool and die shop for producing the various tools and fixtures as well as for machine repair and rebuilding. In addition, there is a tool grinding department capable of maintaining the variety of cutting tools used in an establishment of this kind. This department also makes up and services the cemented-carbide-tipped tools which are used for machining of all non-ferrous metals.

It is of interest to comment on the rather simple but effective method of production scheduling



This is a view of part of the department for reclaiming cutting oil and chips.

### New Production Equipment

PRATT & WHITNEY, Division of Niles-Bement-Pond Co., West Hartford, Conn., has added a new feature to the P&W No. 3B jig borer—the largest size machine of this type made by the company. This new feature is a large non-detachable precision rotary table built into the machine. Two table sizes are available, either 42 in. or 48 in. in diameter. This makes available equipment

ated

era-

the

of

ons.

in a

as a

ush

sec-

the

rec-

t in

rew

role

not

for



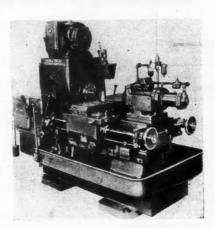
P & W No. 3B jig borer

for precision boring to polar coordinates on large work in addition to regular rectangular coordinate work. Either one type or the other, or both, can be handled without change in setup. The new large, built-in rotary table replaces the regular plain rectangular table on the machine.

The table is equipped with a precision worm indexing mechanism which provides excellent accuracy for average work. For still closer accuracy, a spacing system may be provided in the outer rim.

Power is provided for indexing the rotary table, in addition to the regular horizontal and transverse power travers on the machine slides. Suitable binders lock the table in position solidly while work is being bored.

LODGE AND SHIPLEY MACHINE TOOL Co., Cincinnati, Ohio, has added the 2A Duomatic to its line of automatic lathes. Although designed for a field of work in which a small size automatic lathe is needed, the new 2A Duomatic retains all the features of the bigger, more powerful 3A. The new 2A, it is stated, makes available for the small job recent Lodge and Shipley developments which make more effective use



Lodge and Shipley 2A Duomatic

of multiple tools in turning, and straight and angular facing operations.

The new 2A Duomatic is specially designed for quantity production of lathe work arranged between centers, on an arbor, or in suitable chucks or fixtures. Yet it is equally adaptable, the manufacturer claims, to efficient handling of small runs.

As the name implies, the 2A Duomatic is dual in construction. There is a complete front carriage and tool slide, and a complete rear carriage and tool slide, each independently actuated from its own feed screw. As a result, this new lathe is for all practical purposes like two lathes in one.

NATIONAL BROACH & MACHINE Co., Detroit, Mich., has designed and built the new Red Ring internal gear shaving machine for finishing operations on gears for automatic transmissions, speed reducers and similar mechanisms. It operates on the crossed axes gear shaving principle.

A fast simplified loading process and semi-automatic clamping and ejection mechanisms make possible high production. Floor-to-floor time is said to be 70 seconds on a 6-in, diameter by 1-in, face



Red Ring internal gear shaving machine

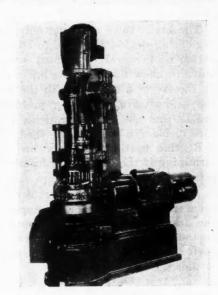
gear. Rigidity of the machine permits high feeds and speeds. Change of set-up can be made in 15 to 30 minutes.

Other features are easily-set automatic feeds and power traverse of the cutter head slide to completely clear the work spindle for loading and unloading.

W. K. MILLHOLLAND MACHINERY Co., Indianapolis, Ind., has designed an automatic indexing machine for drilling, reaming, milling, spot facing and tapping operations where large quantities of parts are manufactured. This Model 5A machine has an indexing table 18 in. to 20 in. in diameter which can be arranged to index six, eight or twelve positions and can be indexed up to 720 times per hr.

Multiple Heads with four, six, eight, ten and twelve or more spindles can be mounted on the vertical master power units and side heads can be mounted on each side of the vertical master unit and equipped with multiple spindles for different operations. Parts can be drilled, reamed, faced and milled or tapped progressively in two planes.

The vertical unit is the master unit and controls positive timing of all oper-



Mullholland Model 5A automatic machine

ations as to feed and indexing. The vertical master unit can be equipped with motor up to 10 hp and side unit up to 3 hp.

The feed is sensitive enough to drill \%-in. holes in steel and powerful enough for \%-in. and 1-in. holes in steel, boring up to 2\%-in., facing up to 3 in. for multiple operations.

Landis Machine Co., Waynesboro, Pa., has brought out an improved Landex hardened and ground die head for use on automatic and semi-automatic screw machines. The Type LL Landex head which supersedes the Type L head has several features which are (Turn to page 70, please)

RIES

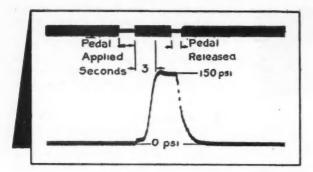


Fig. 1 — Oscillogram showing optimum filling and release time of an actual brake circuit.

The hydraulic braking system of a large airplane consists of a source of hydraulic power, usually an engine driven pump, an accumulator for the storage of energy, and a power brake valve. The brake valve, connected by tubing to a cylinder or its equivalent at the wheel, is the heart of the system. Essentially it has only one function, to allow the pilot to obtain a pressure in the brake determined by the distance and force with which he depresses his foot pedal.

The brake valve must not only serve as a pressure regulating device, but also, to effect the initial application of the brakes, it must serve as a directional valve to allow filling of the brake cylinder with fluid. In the larger airplanes, with the wheels remote from the brake valve, this is a problem, especially with brakes that use large quantities of fluid to expand a tube or bladder to bring the shoes into engagement.

Routine testing methods are acceptable in determining if the leakage, hydraulic feel, control characteristics, etc., of a valve are satisfactory. However, in determining the time interval which exists between pedal movement and brake application and release the instrumentation of the tests is of prime importance. The use of pressure-operated recording devices with slow response characteristics must be

avoided. It is also important that the testing be done on a complete mock-up of the actual brake system. The use of tubing which merely stimulates the brake line, or of any device other than the actual brake will usually result in errors of considerable magnitude.

The use of oscillograph in charting the filling and release characteristics of the brake system has proven to be a valuable aid

This article was prepared from the paper of the same title presented by the author at the War Engineering-Annual Meeting of the Society of Automotive Engineers, Jan. 8-12, 1945, at Detroit.

### Electronic Analysis of

to design and refinement. The availability of a pictorial record settles without question the relative merits of changes in any part of the system.

Fig. 1 shows an oscillogram made to determine the optimum filling and release time of an actual brake circuit; the brakes are approximately 30 ft from the brake valve. The tube size is ½ in., and in addition to the usual bends, tees, and elbows there are

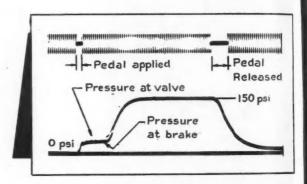


Fig. 2 — Braking characteristics with brake valve one foot from expander tube brake.

two swivel fittings in the line. The brakes are of the expanding tube type, and it was determined by test that the brake used had a capacity of 20 cu in. at 250 psi. The hydraulic pressure at the valve was 1000 psi. Pressure at the brake was limited to 150

psi by spilling over a relief valve. It will be seen that the time required to fill the 20 cu in. brake at 1000 psi potential is 0.3 sec.

fro

sec

psi

sur

psi

bra

be

pre

in

WE

un

su

sh

th

Fig. 2 shows the characteristics with the brake valve about one foot from the expander tube brake. The time interval between valve lever movement and actual braking is shown to be ½ sec at 150 psi. In order to plot a filling curve it is necessary to obtain the time interval at various pressures.

In Fig. 3 a curve has been plotted from the oscillograms taken at pressures

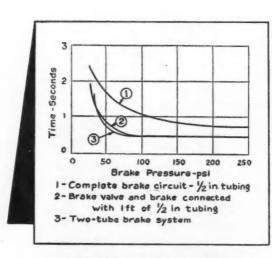


Fig. 3—Filling time curves showing effect of tubing length and two-tube brake setup.

### of Airplane Hydraulic Braking Systems

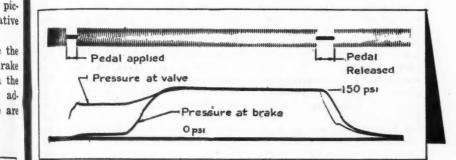


Fig. 4—Oscillogram with complete brake line between valve and brake.

from 250 to 25 psi. The filling time as noted is  $\frac{1}{2}$  sec at 150 psi, at 50 psi the time is 0.8 sec and at 25 psi 2 sec. The increase in time at the lower pressures is due to two factors; the restrictions within the brake and the brake springs, which represent 16 psi leaving 9 psi head for filling.

Fig. 4 shows the result of inserting the complete brake line between the valve and the brake. It will be seen that at 150 psi filling time has lengthened appreciably; it is now 0.8 sec, which represents a loss in time of 0.3 sec due to tubing alone. Oscillograms were taken at various pressures

under these conditions and the results are plotted on Fig. 3.

d

e of

d by

ı in.

was

150

re-

seen

d to

e at

0.3

arac-

rake

from

rake.

ween

and

n to

psi.

lling

o ob-

l at

has

scil-

ures

TRIES

An interesting experiment in reducing time lag is to adapt the circuit to the use of two brake tubes; one for filling and the other for reaction. This arrangement is shown on Fig. 5. The purpose of this circuit is to allow the brake valve to remain fully open until the reaction (indicating a filled brake) has traveled back through the second tube to the valve. A comparison curve showing the results of this test is plotted on Fig. 3.

In addition to furnishing accurate information on filling time the oscillograph can be used for evaluating other phases of brake valve performance. Data on release time can be plotted directly from the films. Surges or other erratic conditions are readily observed. The oscillograms are of

By Duncan B. Gardner

Chief Product
Development Engineer,
Vickers, Inc.

great value in determining if the valve has satisfactory response characteristics—that is if pressure at the brakes is in response to pedal movement by the pilot. Films

of this type are particularly valuable in analyzing the control characteristics at low pressure. For the initial applications of the brakes on landing the airplane is partially air-borne and with the wheels lightly loaded, good control at low pressure is essential to avoid skidding. The emphasis which has been placed on a complete analysis of the entire braking system is the result of a conviction that there is a need for a direct and accurate method for determining the value of design changes in brake valves or in any of the components of the system.

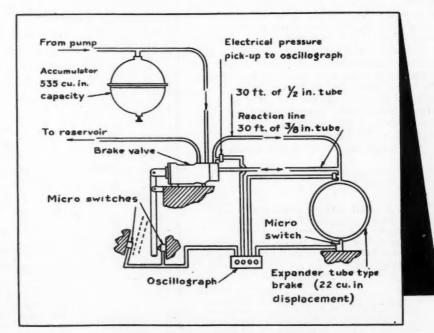


Fig. 5-Circuit of two-tube brake system.

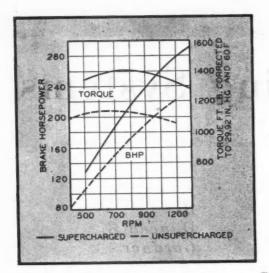


Fig. 1—Performance curves of a Buda commercial Diesel engine aspirated and supercharged; six cylinders; bore—6.75 in.; stroke—8.750 in.; displacement—1879 cu in. Curves represent maximum usable power for intermittent service application such as automotive, shovel, excavator, etc. Maximum recommended speed for automotive application is 1100 rpm when normally aspirated and 1200 rpm when supercharged. Maximum recommended speed for other intermittent service is 1000 rpm when normally aspirated and when supercharged.

ANY discussion of supercharging invariably leads to speculation as to application on passengar car engines. That is the mass market with all of its immense potentialities for any worthwhile piece of equipment. Racing cars have had a long history of experience with superchargers and a considerable number of privately owned passenger cars have been "souped up" by supercharging in the past. These were expensive installations but usually cost was not a consideration.

In dealing with a matter of industry-wide importance, it is essential to weigh it from an economic viewpoint. The fact that the highly developed military aircraft engine uses direct-driven centrifugal superchargers or exhaust-driven turbo-chargers should not lead to the hasty conclusion that, by the same token, the highly devel-

Fig. 2—Full throttle performance of a 468 cu in. commercial engine unsupercharged and supercharged with a coupled belt driven Roots type blower rotated 1.66 times engine speed. Compression ratio 4.57 to 1. (Courtesy Ethyl Corp.)

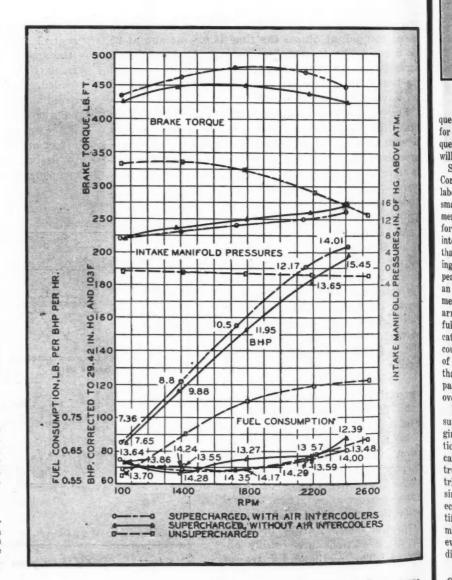
Figures in parenthesis adjacent to power curves denote intake manifold pressures in in. of above a ton. Figures in parenthesis adjacent to fuel consumption curves denote air-fuel ratios.

# Superchargers

oped motor car engine of the postwar era should or must receive the same treatment. Remember that cost is relatively unimportant on military aircraft, or for that matter on a commercial airplane. Since the primary object of supercharging in these cases is to maintain sea level horsepower at high

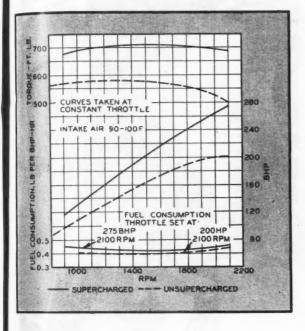
altitudes, the ability to perform at high altitudes outweighs all other economic considerations. It is in this field that the turbocharger has excelled since the exhaust driven supercharger operates under the most favorable conditions at high altitudes.

So far as passenger cars are concerned, there is little question that engine design will undergo radical changes in the future. The availability of higher octane fuels, the design of combustion chambers to handle higher compression ratios, the probable use of improved carburetors of injection type or of solid fuel injection systems, these and other advanced principles will combine to produce engines of radical design and performance. Many engineers visualize engines of smaller displacement, smaller in size and lighter in weight, capable of higher performance and with greater fuel economy.



0

# for Motor Vehicle Engines



enlical ility

cher

e of

type

hese

om-

de-

eers

ace-

ance

Un-

By Joseph Geschelin

Fig. 3—Comparative curves of Cummins NHB-600 Diesel engine, unsupercharged and the NHBS-600 supercharged version of the same model six-cylinder 5.125 x 6.000 engine.

quest.onably during this development, for some years after reconversion, the question of supercharger installation will be given due consideration.

Seven or eight years ago the Ethyl Corp. began a comprehensive series of laboratory and field experiments with small engines leading to the development of supercharger applications. Unfortunately, this important work was interrupted by the war but it is hoped that the project will be revived. During the course of this early work it appeared feasible to consider the use of an engine of relatively small displacement equipped with a supercharger so arranged as to become operative only at full throttle. The initial data indicated that a small engine thus equipped could be operated through a wide range of load demands with greater economy than could a large engine operated at part and full throttle unsupercharged over the same load range.

For the time being let us assume that supercharging for passenger car engines is something for later consideration and confine ourselves to its application on heavy duty vehicles for motor trucks, buses, earth moving and industrial equipment, marine engines, and similar applications where operating economy is paramount and can be justified by any practical expedient. It may be said at this point that whatever attention is given to these immediate problems will provide an invalu-

able background for engine designers in the passenger car field.

#### Supercharger Applications

Superchargers have been developed in a number of types but for the purpose of this discussion we may confine ourselves to the following:

 Centrifugal blowers—direct driven—most suitable for constant speed operations and widely used on aircraft engines. This type also has been used on automotive vehicle engines.

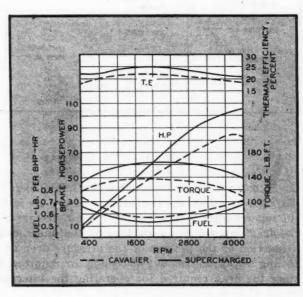
- Positive displacement, direct driven blowers of Roots type and van type. These are considered more suitable for motor vehicles where variable speed operation is involved. Roots blowers are widely used on two-stroke cycle Diesel engines.
   Turbochargers exhaust driven currently used almost exclusively on military
- 3. Turbochargers exhaust driven currently used almost exclusively on military aircraft to provide sea level output at high altitude. Elliott-Buchi Turbochargers have been applied to four-stroke cycle Diesel engines with ratings of 250 hp and unward.

In the opinion of well informed engineers, the turbocharger offers the most interesting possibilities for heavy duty automotive engines and possibly for passenger car engines as well.

Opinions vary as to the best field of application for the supercharger. Since the mechanism is expensive-at the present time—and represents a sizable percentage of the cost of an engine, certain engineering considerations must be taken into account. In the first place, the selection of the type of unit depends not only upon the type of engine but upon the application of that engine. It matters considerably whether an engine is used for continuous duty at constant speed or for flexible operation as in the case of a light vehicle or passenger car. Performance of automotive type two-stroke cycle Diesel engines is substantially improved

(Turn to page 106, please)

Fig. 4—Comparative curves of Graham supercharged and conventional engines of same bore, stroke, displacement. Compression ratio, 4.875 to 1 ratio. Condrive on 2.675 in. centers.



IES

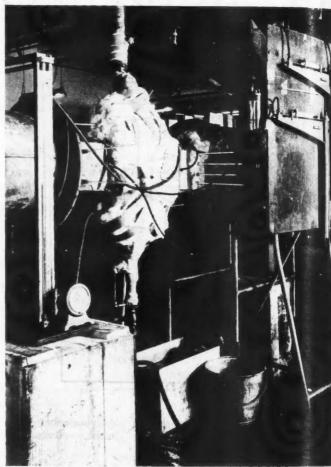
# Intercooler

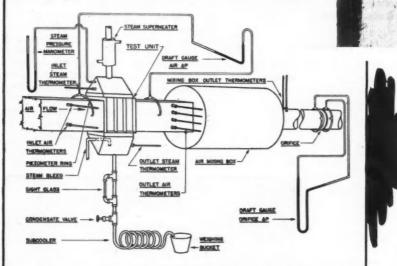


Fig. 1 — Section of a dimpled tube.

Fig. 2 — Setup for steam-air test.

Fig. 3—Schematic layout of setup for steamair test.





IRCRAFT engine supercharger intercoolers are designed to reduce the temperature of the air leaving the supercharger before it enters the carburetor. Since the drag imposed on an airplane by the intercooler is a function of the product of the pressure drop of the cooling air by the amount of cooling air required, and since the drag required for operating the intercooler

increases substantially at high altitudes, it became necessary to develop an improved form of low drag intercooler for modern high altitude, high speed airplanes.

The first step in this development was to partially flatten the tubes so that their axes would be parallel to the cooling air flow direction. This permitted a greater flow of cooling air at the same pressure drop and reduced the cooling air drag. Although the outside film coefficient was probably reduced in many cases, the inside coefficient, which with round tubes had been

smaller than the outside coefficient, was raised by the decrease in the internal cross section of the tube. The net result was an increase in overall heat transfer coefficient for a given horsepower without reduction in surface per tube. Also, flattening the tubes allowed them to be placed closer together, thus forming a lighter weight and more compact unit.

# r Tube Design

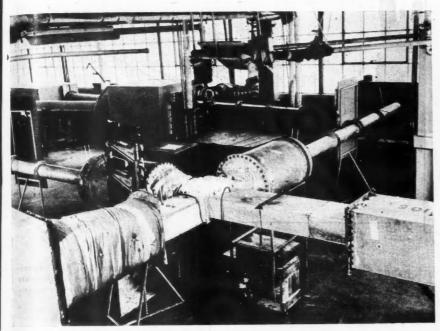


Fig. 4—Setup for air-air test.

Fig. 5 — Comparison of experimental heat transfer coefficients for air inside tubes. Dashed lines show steam-air test results which were modified by air-air test results shown by triangles.

lti-

elop

ter-

igh

ent

the

er-

at

ced

ut-

re-

effi-

een

the

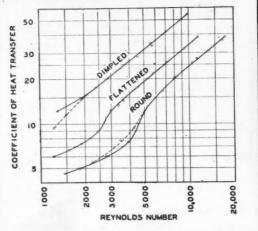
be.

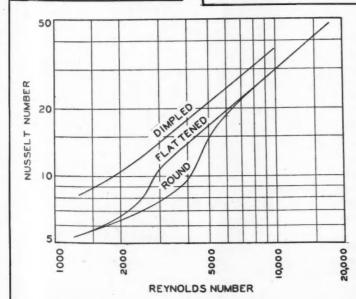
ns-

ucoes

m

IES





### By Frederick H. Green and Leighton S. King

Heat Transfer Engineers, AiResearch Mfg. Co.

> In an attempt to reduce still further the cooling air drag horsepower, the flattened tubes were dimpled with small creases about 0.05 in. apart running crosswise on the flattened portion of the tubes. At the same time the outside dimension perpendicular to the flattened portion of the tube was increased to avoid increasing the pressure drop of the supercharged air inside the tubes too greatly by the introduction of the dimples. The net result of this dimpling was greater than anticipated. In one typical case the cooling

air flow was reduced 30 per cent at an increase in pressure drop of only 25 per cent, resulting in a net saving of 12.5 per cent in horsepower required. Since the reduced cooling air flow required resulted in a log mean temperature difference only 87 per cent as great as before, it was apparent that this change had made a substantial increase in heat transfer coefficient, most of which was estimated to be an increase in the coefficient for the air flowing inside the tube, since the air flow out-

side had been reduced. The tests described in the following paragraphs were performed in an attempt to obtain information which would correlate these results with the usual methods of computing heat transfer coefficients.

The apparatus tested consisted of three tubular type aircraft engine intercoolers of approximately the same external dimensions. One unit was constructed with round tubes, one with partially flattened tubes and one with partially flattened and dimpled tubes.

(Next page, please)

Fig. 6 — Comparison of experimental values of Nusselt number for air inside tubes.

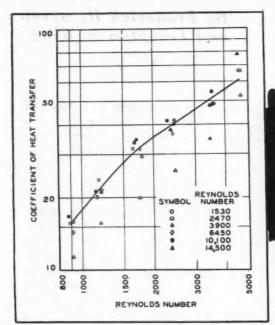
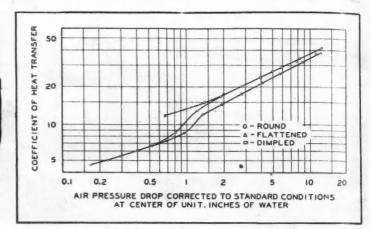


Fig. 7—Experimental heat transfer coefficients for air outside round tubes, showing results with various values of Reynolds number inside the tubes.



The flattened and flattened-dimpled tubes had the same flattening dimensions and were placed with a no-flow clearance or cooling air passage which was the same clearance as the diagonal clearance used in the round tube unit. A longitudinal cross section of a portion of a dimpled tube is shown in Fig. 1.

For the first tests the units were mounted as shown in Figs 2 and 3, with air being blown through the tubes while steam condensed around

the tubes. The steam was fed at approximately two psi gage pressure and 10 F superheat to provide complete dryness and allow determination of its enthalpy from measurements of temperature and pressure alone.

It was found that when the temperature at the outlet of the mixing box was corrected for the experimentally determined drop of temperature in the mixing box, that this corrected temperature agreed very well with the average of the four outlet thermometers placed immediately after the unit.

Most of the air flows were measured with a flat plate sharp edged orifice in a duct following the mixing box. The largest air flows were computed from the pressure drop across the unit under test by extrapolation of the pressure drop vs flow curve drawn from the runs where the flow was determined by the orifice. The apparatus was thoroughly insulated with glass wool at all parts where needed.

For the other series of tests the units were mounted as shown in Fig. 4. Hot air was used inside the tubes while room temperature air was passed outside the tubes. Outlet air temperatures were measured after the air (Turn to page 67, please)

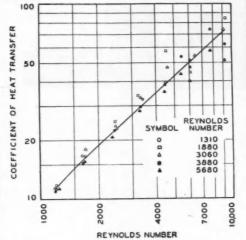
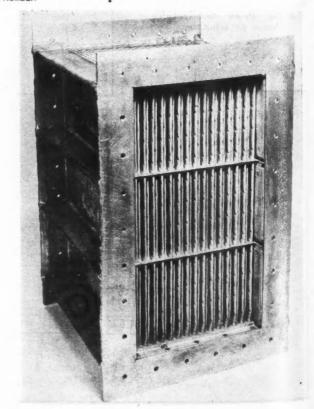


Fig. 9—Comparison of experimental heat transfer coefficients and pressure drop for air inside tubes.

Fig. 8—Experimental heat transfer coefficients for air outside dimpled tubes, showing results with various values of Reynolds number inside the tubes.

Fig. 10—Test unit with dimpled tubes.





#### NOTHING LOCKS LIKE A SPEED NUT

Only SPEED NUTS provide a COMPENSAT-ING thread lock and a SELF-ENERGIZING spring lock. As the screw is tightened the two arched prongs move inward to lock against the root of the screw thread. These free-acting prongs COMPENSATE for tolerance variations. Compression of the arch in prongs and base creates a SELF-ENERGIZ-ING spring lock. These two forces combine to definitely prevent vibration loosening.

OWER COSTS . . . reduced inventories . . . fewer handling problems . . . availability . . . in a few words, here is why Purchasing Agents prefer SPEED NUT fasteners.

Their initial cost, in many cases, is less than ordinary fasteners. Then, when you add in the savings in assembly time and reduction in number of parts brought about through the use of SPEED NUTS, total net assembly costs really take a tumble.

SPEED NUTS keep inventories down, too, because they completely do away with washers, and often eliminate many other assembly parts as well. This, of course, means quick inventory turnover and savings in the handling and dispersing of parts in stock.

Finally, Purchasing Agents have learned that Tinnerman service is dependable. Unlimited production and service facilities assure the utmost cooperation in getting SPEED NUTS on their way to you...on time. Investigation will prove that SPEED NUTS should be YOUR first choice, too. Write for information today.

#### TINNERMAN PRODUCTS, INC., 2059 Fulton Road, Cleveland 13, Ohio

In Canada: Wallace Barnes Co., Ltd., Hamilton, Onterio In France: Aerocessoires Simmonds, S. A., Paris

In England: Simmonds Aerocessories, Ltd., London In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne



# New Products for Aircraft

#### Newest Pesco Motor-Mounted Hydraulic Pump

The newest Pesco motor-mounted hydraulic pump for feathering propellers on military aircraft is the No. 1E-777-AC. It is designed and manufactured by Pesco Products Co., Cleveland, Ohio, and offers various improvements which cause it to supersede older



Pesco No. IE-777-AC hydraulic pump

models. Incorporating the Pesco "pressure-loading" feature, this unit, weighing 14.4 lb has a capacity of four gpm at pressure of 400 psi, or three gpm at 1000 psi. The pump is designed to operate two out of every 15 minutes at 1000 psi. A bleed hole drilled through the valve seat permits circulation of oil through the pump when it is idling or inoperative.

#### **Air Navigational Plotter**

The Jardur-Warner air navigation plotter, made by Jardur Aviation Co., New York, N. Y., eliminates the use of straight edges, dividers, protractors, parallel rules and distance scales. It is used in chart work to measure distances on all the Lambert charts, using the plotters direct-reading scales, and can be used on any portion of all charts, especially in upper regions or between meridians. The plotter is used also in piloting, dead reckoning, radio, and celestial methods of navigation as well as in many other auxiliary uses, such as graphic solution of wind vector problems, construction of deviation graphs and small area chart construction.

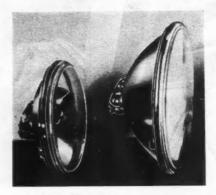
Corrections for variation and deviation may be set in to the Jardur-Warner plotter mechanically, if desired, and includes provisions for setting up and reading a compass deviation curve directly on the plotter, so that the deviation on any heading may be obtained directly without interpolation.

The plotter is made of laminated vinylite and has two color scales for easy reading.

#### Landing Lamps for Private Aircraft

Two small editions of landing lamps have been developed to provide private peacetime aircraft with suitable "eyes" for night flying, by G.E. Lamp Department at Nela Park.

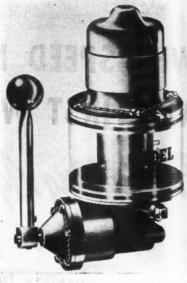
The smaller lamp has been designated as G.E. landing lamp No. 4509; the larger as No. 4537. Each is an all-glass hermetically sealed and self-reflecting unit. Cover glass or "face" of each new



G.E. landing lamps

lamp is clear glass. Each unit is rated at 100 watts.

The small landing lamp, only 4½ in. in diameter, produces a maximum beam rated at approximately 100,000 cp. It is intended for use on relatively small "personal aircraft" of the single and two-seater type.



Adel power package No. 14372

The larger lamp, 5% in. in diameter, produces a maximum beam rated at approximately 200,000 cp. It is designed for use on cabin-type planes seating four to eight passengers. Cover glass of this unit has an almost flat surface conducive to use in retractable landing light gear.

#### Power Package for Light Airplanes

A new hydraulic power package has been brought out by Adel Precision Products Corp., Burbank, Cal., to provide a compact, light weight source of power for actuation of landing gear and wind flaps in light airplanes. It is adaptable also to many non-aircraft uses requiring an independent or self-contained hydraulic system.

The Adel Power Package No. 14372 comprises an electric gear type fluid pump, visual reservoir, adjustable pressure relief valve, thermal relief valve, a cylinder by-pass valve and 4-way selector valve connected to manual control.

Pump delivers fluid under 300 psi pressure at the rate of 0.40 gpm with a power requirement of 298 watts at 12 volts.

#### Low-Cost, All-Metal, Personal Plane

All American Aircraft, Inc., is placing on the market a new personal owner airplane, the "Ensign." It is powered by an 85-hp engine and equipped with tricycle landing gear. Cruising speed is 115 mph, maximum speed 125 mph, and cruising range 500 miles.



# Check these Features of

# VICKERS

**Variable Delivery** PISTON TYPE PUMPS

> Hydraulically **Balanced Pintles**

Among the features indicated below are many of the reasons for the high overall mechanical efficiency and the high volumetric efficiency of Vickers Variable Delivery Piston Type Pumps. Also, the inertia forces of the rotating parts are minimized . . . the cylinders are arranged axially permitting more compact design.

Write for new Bulletin 43-11 which includes description of construction, operation and types of controls, installation drawings, performance characteristics, installation and operating instructions of Vickers Variable Delivery Piston Type Pumps.

VICKERS Incorporated

1428 OAKMAN BLVD. . DETROIT 32, MICHIGAN

Application Engineering Offices
CHICAGO • CINCINNATI • CLEVELAND • PHILADELPHIA • LOS ANGELES DETROIT - NEWARK - ROCHESTER - ROCKFORD - TULSA - WORCESTER

Large Oil Passages Accommodate Oil Flow at Minimum Velocity

**Multiple Cylinders Arranged Axially** 

eter. aprned

ting

s of con-

ling

has

sion

pro-

e of

and

raft elf-1372 luid res-

1--e,

nual

psi vith at

is

Valve Plate of Ball Race Steel, with **Hydraulically Balanced** Valve Face Maintains **Optimum Clearance** and Minimizes Wear

**All Working Parts** Submerged in Continuously Circulatina Oil

Interchangeable and **Optional Control** Mechanism

> Floating Universal Joint Shaft does not transmit Hydraulic Power load

**Ball Joint Connecting Rods** impart straight line motion to Pistons and transmit Hydraulic Power load

> Forced Feed Lubrication to Connecting Rods, Pistons, Valve Faces and Pintles

> > **Direct Drive at** Nominal **Motor Speeds**

Heavy Duty Radial and **Thrust Bearings** 

**Driving Flange Integral** with Drive Shaft

There Are More Than 5,000 Standardized VICKERS Units For Every Hydraulic Power and Control Function

# New Products

#### **Direct Fired Heaters**

A new line of direct-fired heaters for commercial and industrial applications has been brought out by Herbert H. Davis Co., Cicero, Ill. The heaters range in capacity from 75,000 to 2,000,000 Btu-hr, and are available for all types of fuel—coal, gas and oil. The units are made entirely of steel and are

Davis heater

completely self-contained. They are equipped with automatic control systems and lend themselves to a wide variety of installations, either for air distribution direct through rotatable diffusers or through ducts.

The unit is shipped in two sections. This makes possible unloading and placing without heavy crane facilities, entry through much smaller building openings, and shipment to any part of the United States by truck. Filters may be applied without special transformations requiring additional floor space.

#### Pressure Sensitive Device Uses Strain Gage Principle

Utilizing the principle that the electrical characteristics of a wire filament change with a physical strain, the Baldwin Locomotive Works' Southwark Division has developed a new instrument called the SR-4 pressure sensitive device. It is used to convert gas or liquid pressure to electrical energy for measuring, recording or controlling. Its extreme accuracy, one-fourth of one percent of full scale, will mean that the device can be used for control operations that heretofore have not been possible. It is available in several ranges up to 0-to-20,000 psi.

Since it is essentially an electronic device it will enable results to be transmitted long distances whether for direct reading, recording or control. Transmission even by radio is feasible.

The SR-4 pressure sensitive device is based on the principle of the SR-4 strain gage. The heart of the device is a very fine filament wire bonded to a hollow metal core against which is exerted the gas or liquid pressure to be measured. As the pressure increases this filament stretches, thus changing the diameter of the wire and causing measurable changes in the electrical resistance of the wire. This change in resistance varies the amount of current flowing through the filament circuit and, when amplified, these changes show up on the dial or are used to actuate a control system. The filament is sensitive to a "stretch" of the metal core of only one-millionth of an inch.

#### Torque Wrenches for Light Precision Assembly

The JOTEE and JOEL are two new torque wrenches made by the JO Manufacturing Co., South Gate, Cal. The JOTEE is a ratchet type torque wrench, constructed of aluminum. Preset at the factory to any torque within a range of 5 to 40 lb-in., it may be reset in the plant tool room whenever assembly specifications change.

The JOEL has the same range as the JOTEE, and is particularly adaptable to close assembly work. It is made in both the ratcheting and non-ratcheting type of tool.

The action of both tools is posi-

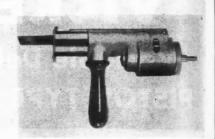


JOTEE and JOEL torque wrenches

tive releasing when the predetermined torque is reached, making errors in judgment impossible.

#### Portable Power Saw Uses Standard Blades

The Wyco Ay-Speed saw is now in production at Wyzenbeek & Staff, Inc.



Wyco Hy-Speed saw

Chicago, Ill. It attaches to any ¼-in. electric drill, air drill or flexible shaft. Ordinary hack saw blades are used for sawing all metals that can be sawed with a hack saw and, in addition, standard ¼-in. shank machine files make the Wyco Hy-Speed saw an efficient filing machine.

All rotating parts are ball bearing and run in oil. No gears or cams are used. Short pieces of hack saw blades are held by means of a hollow-head set screw.

#### Improved Electrode for High Tensile Steels

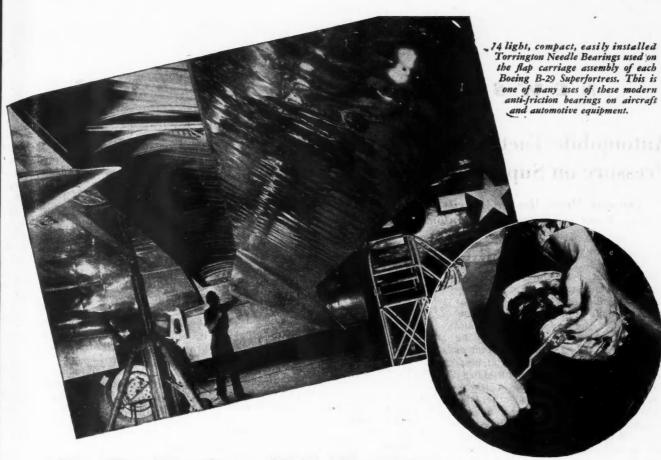
A new shielded arc electrode for groove butt joints and welding horizontal or flat fillets in the higher tensile steels, such as ASTM A-212, has just been announced by the Lincoln Electric Co., Cleveland, Ohio. Designated as "Fleetweld 11-HT," it is said to have characteristics not found in previous rods designed for welding steels of this type.

The electrode may be used with either alternating current or direct current and if direct current is used, the electrode should be negative. The new electrode conforms to American Welding Society specifications E-7020 and/or E-7030, and is available in 3/16-in. and ¼-in. diameter sizes, 18 in. long.

#### Hedstrom Will Introduce Line of Hand Tools

The Oscar W. Hedstrom Corp., Chicago, Ill., will produce a line of hand tools to supplement its manufacture of aluminum alloy products and line of drill jigs and fixtures. The series of tools features the "Larc-o-matic," an automatic, adjustable, rachet-action wrench, and includes the "Speed-o-matic," a companion to the "Larc-o-matic"; the "Rockerench"; a new im-

(Turn to page 103, please)



### Needle Bearings Help Operate B-29 Superfortress Wing Flaps

Equal to one-fifth the area of the entire wing, the wing flaps of the mighty Boeing B-29 Superfortress enable the 130,000-pound plane to take off and land on fields hardly larger than those used for ordinary combat operations.

That means, of course, terrifically high loads on the flaps and their tracks... loads they handle efficiently and reliably on Torrington Needle Bearings. "No other bearing could be found," Boeing's Engineering Department reports, "small enough to fit the space limitations, yet able to withstand the high loads."

In addition, control pulleys and other mechanisms aboard the giant plane operate on these light, compact, anti-friction bearings, bringing the number used on each plane to over 600.

Detailed data on these and other applications is available for your engineering files. The Torrington Needle Bearing Catalogue #32 can help you solve many a problem of friction elimination that reaches your drawing board. Send for your copy today.

#### THE TORRINGTON COMPANY

Established 1866

TORRINGTON, CONN. • SOUTH BEND 21, IND.
New York Boston Philadelphia Detroit Cleveland
Seattle Chicago San Francisco Los Angeles Toronto
London, England



### TORRINGTON NEEDLE BEARINGS



mined ors in

1/4-in. shaft. ed for sawed stand-te the filing aring s are blades

d set

for

ensile

just

ectric

d as

have

vious

this

ither

rent

elec-

elec-

ding

d/or

and

Chiand e of of

of an tion d-oc-oim-

IES











October 1, 1945

#### NEWS OF THE INDUSTRY

#### **Automobile Factory Shut-Downs Relieve Pressure on Supply of Sheet Steel**

Normal Metal Market Activity Waits Upon Improved Visibility of What is in Store for Automobile Industry from Unionism

By W. C. Hirsch

Resumption of anything like normal metal market activity waits upon improved visibility of what is in store for the automobile industry from unionism. Pressure on the supply of sheet and strip steel, which was unrelieved during the first half of last month, eased off as the result of the postponement of shipments made possible by shut-downs. Announcement of new basing points for stainless steel products and other specialties reflects more intensive competition in the steel market at the very outset of the from-war-to-peace transition period. Many steel buyers fear that the long delay in adjusting ceiling prices will result in awry market conditions later on.

Leading steel companies estimated in mid-September that their production costs exceeded current ceiling prices by approximately \$7 a ton; smaller producers have claimed right along that there is a gap of as high as \$10 a ton between their cost of production and what they are permitted to charge. It has been generally emphasized that these deficits do not take into account the possible lifting of wage scales in response to union demands. So that aside from whatever upping of prices may become necessary to cover future wage scale increases, a \$7 per ton advance overhangs the market. Past experience has shown that a reasonable advance in steel prices meets with little resistance on the part of buyers, but what their reaction will be if unprecedented mark-ups should have to be resorted to is the cause of much uneasi-Most observers see a decided advantage, however, in the synchronizing of higher wage demands with the necessity of higher prices, the mobilizing of public opinion on the side of common sense being greatly facilitated thereby.

Release by WPB of an exhaustive report on the tin situation has led some enterprising statisticians to indulge in estimates of 1946 tin needs, which they place at 65,000 long tons. They contend that if the Navy lowers its sights to the extent generally expected and secondary metal is made use of wherever it will serve the purpose, 65,000 tons will carry American consumers through nicely. This tonnage,

made up of supplies from Bolivia, the Belgian Congo, China and possibly from Malaya and the Dutch East Indies, seems a reasonable expectation following the surrender of Japan. In fact, photographs of some of the smelters that were thought to have disappeared during the war have been received by tin importers. Automobile manufacturers have recently told WPB that they will be able to get along with two pounds of tin per car during the next year and a half. This compares with an average of 3.35 pounds per car in 1941 models. A new contract for Bolivian tin concentrates, covering shipments up to June 30, 1946, has just been signed. Many are of the honest belief that the tin situation has been pictured as too discouraging in Washington and that future developments will prove the apprehension that tin will be a bottleneck in the reconversion program is not justified.

#### Henry Ford Resigns, Succeeded by Grandson

Henry Ford II has been named president of Ford Motor Co., succeeding Henry Ford, his grandfather, who resigned.

The appointment of Mr. Ford II who

has been executive vice president since April 28, 1944, was made by the directors after they had accepted Henry Ford's resignation. Mr. Ford's letter to the directors follows: "I hereby resign the office of president of this company to take effect upon acceptance. I feel free to take this step at this time because the critical period during which I again assumed office has passed. As you know, I have many personal interests to which I now desire to devote most of my time. I shall be glad to remain on the board and to assist in an advisory way.

It is

Th

is co

trial

there

last l

get

Sa

ment

civili

facto

maki

ward

get

Ex

tors

simil

toys.

get

A

tric :

indu

faste

meth

ards.

Ar

that

natio

most

the n

int

missi

prev

iamn

with

Resis

To

ducti

that

dend

checl

grapi

Arm

the s

A 93

cells

neeri

October

per

"May I recommend to the board that it consider the appointment of my grandson, Henry Ford I., as my successor.

"To the officers and directors I extend my thanks for the cordial cooperation always given me and to which is due so greatly the success of the company."

Mr. Ford II was elected a director of the company on Dec. 19, 1938, and was appointed vice president on Dec. 15, 1943. His advancement to the executive vice presidency came in April, 1944.

The elder Mr. Ford's resignation marks the second time he has relinquished the presidency of the company. He first became president on July 14, 1906, and held the position until he was succeeded by his son, the late Edsel B. Ford, on Dec. 31, 1918. On June 1, 1943, a few days after Edsel Ford's death, he again assumed the office. Ford Motor Co. directors, in addition to Henry Ford and Henry Ford II, are: Benson Ford, H. H. Bennett, B. J. Craig, M. L. Bricker, R. R. Rausch and Frank Campsall.

#### Goodyear F2G



This new plane, developed too late for use against the Japanese, is said to have a rate of climb of 7,000 fpm—about fifty per cent better than the climb of the latest type of jet propulsion planes. It is powered by a Pratt and Whitney Wasp Major R4360-4 engine. This 28-cylengine has a military rating of 3,000 hp, and develops 3,650 combat hp. Top speed is 428 mph at 16,000 ft without water injection, and 450 mph at the same altitude with the water injection system in use.



#### It is reported that . . . . . .

The National Research Council is compiling a directory of industrial research laboratories of which there were 2,264 in 1940 when the last listing was made.

get ready with CONE for tomorrow

Said to be the largest government-owned plant yet leased for civilian use, a 21 million dollar factory is being converted for the making of streamlined trains. Edward G. Budd, Philadelphia.

get ready with GONE for tomorrow

uc-

ich

the

ind

ec.

cu-

44.

ion

lin-

ny. 14,

vas

B.

rd's

ord

to re:

and

Experimental track-type tractors are using rubber tracks quite similar to those used on children's toys. B. F. Goodrich.

get ready with GONE for tomorrow

A new technique, using an electric arc, makes it possible to cut industrial diamonds four times faster than the conventional method. National Bureau of Standards.

get ready with CONE for tomorrow

An aviation magazine estimates that American domestic and international air carriers will put almost \$750,000,000 in equipment in the next five years. Aviation News.

getready with CONE for tomorrow

A unique type of power transmission, which is positive and yet prevents gear breakage in case of jamming, uses metal gears meshed with gears of an elastic vinyl resin. Resistoflex Corp.

set ready with CONE for tomorrow

Tooling has begun for the production of a calculating machine that automatically figures dividends, hourly pay rolls, writes checks and keeps records at 4,000 per hour speed. Addresso-Multigraph Corp.

get ready with CONE for tomorrow

A dry cell developed for the Army is reported to have 5 times the shelf life of ordinary batteries. A 93.6 volt radio battery of 72 cells weighs only 2 pounds. Engineering & Mining Journal.

An oxy-acetylene cutting unit developed by the Navy can be carried on the operator's back and used without setting it down.

get ready with GONE for tomorrow

One of our admirals reports that welded ships have proved to be stronger than riveted ones during the war. Admiral Emory S. Land.

get ready with CONE for tomorrow

The American optical industry is now producing, by automatic, mass production methods, lenses superior to those formerly made by hand in Germany.

get ready with CON Efor tomorrow

The Army has been using a very compact radio communication system that can carry facsimile pictures, telephone conversation and teletype messages all at once.

A new pocket-size instrument reports power output and efficiency to the pilot of a plane by measuring constantly the deflection of the engine under the force of explosions. Consolidated-Vultee.

get ready with CONE for tomorrow

Claims for a new rubber cement include adhesion to metals, plastics and ceramics; shear strength of 3,250 pounds per square inch and tension strength of two tons. B. F. Goodrich, "Plastilock"

get ready with CONE for tomorrow

The first section of the Society of Automotive Engineers to be established outside continental United States has been organized in the Hawaiian Islands.

get ready with CONE for tomorrow

A new electrical device analyzes the composition of metal and indicates its maximum endurance. Electrical Manufacturers Public Information Center.

get ready with CONE for tomorrow

A new stainless steel is soft and ductile enough to be formed and fabricated like aluminum. Rustless Iron & Steel Corp., Baltimore.



#### **Business in Brief**

Written by the Guaranty Trust Co., New York, Exclusively for Auto-MOTIVE AND AVIATION INDUSTRIES

Continued lower levels of business activity are indicated by current reports. The New York Times index for the week ended Sept. 1 stands at 127.8, as against 127.5 for the preceding week and 140.9 a year ago.

Sales of department stores, as re-ported by the Federal Reserve Board for the week ended Sept. 8 (a holiday week), were 1 per cent smaller than those in the corresponding period last year. The total for the year to date is 11 per cent above the comparable

1944 figure.
Electric power production during the same week was 7.5 per cent smaller than a year ago, as against a comparable decline of 6.3 per cent in the preceding week.

Railway freight loadings during the week ended Sept. 8 totaled 730,628 cars, showing a decline of 15.1 per cent from the figure for the preceding week and one of 11.5 per cent below that for the corresponding period last

Crude oil production in the same period averaged 4,518,400 barrels daily, as against 4,875,500 barrels a week earlier and 4,689,400 barrels a year ago.

Bituminous coal production during the week ended Sept. 1 totaled 12,150,-000 net tons, which is 50,000 tons below the output for the preceding week but 466,000 tons above that for the corresponding period last year. Total production for the year to that date amounts to 7.4 per cent less than the comparable 1944 figure.

Civil engineering construction contracts awarded during the week ended. Sept. 13 were the second highest for the year to that date, according to Engineering News-Record, Caling \$60,389,000, which is nearly double the figure for the preceding week (a holiday week) and is 42 per cent above that for the similar period last year. The total value of contracts reported so far this year is 2 per cent above that a year ago.

The wholesale price index of the Bureau of Labor Statistics for the week ended Sept. 8 continued to move downward, standing at 105,0 per cent Civil engineering construction con-

week ended sept. 8 continued to move downward, standing at 105.0 per cent of the 192% average, as against 105.2 a week earlier and 103.6 a year ago. Member hank reserves rose \$149,-000,000 during the week ended Sept. 12, mainly because of an increase of \$485,000,000 in Federal Reserve bank redit outstanding, partly offset by advances of \$294,000,000 in Treasury deposits with the Federal Reserve banks, \$43,000,000 in the amount of money in circulation, and smaller changes in other items. Loans and investments of reporting member banks during the preceding week demember clined \$164,000,000, despite a rise of \$73,000,000 in commercial, industrial and agricultural loans.

#### Golden Jubilee of The American Automobile

The Golden Jubilee of the American Automobile, to be celebrated in November by the Museum of Science and Industry at Chicago, is attracting wide attention on the part of manufacturers. Many of the foremost names in the industry have joined with the Museum in staging an exhibition that will tracethe history and development of the

automobile from its beginnings to the present day.

The Museum's Golden Jubilee program will open on Nov. 2 and will be accentuated by a series of special events that will reach its peak in a reenactment of the first automobile race on Thanksgiving Day, Nov. 22. While the re-enactment of the first race will mark the close of special activities incident to the Golden Jubilee, the exhibits will remain on display at the Museum until late winter.

#### AWPC Members Built 60 Per Cent of U. S. Planes

West Coast aircraft manufacturers, in carrying out one of industry's heaviest wartime assignments, delivered 60 per cent by weight of all the fighting planes produced in the United States while the nation was at war, according to Robert E. Gross, president of the Aircraft War Production Council, which has completed its mission and ended operations.

The Council companies-Boeing, Consolidated Vultee, Douglas, Lockheed, North American, Northrop and Ryan produced 125,823 warplanes with a total airframe weight of 1,576,841,300 lb. This was 60 per cent of the national output by weight, and 46 per cent of the unit total.

#### Holler Resigns

William E. Holler, general sales manager of Chevrolet Division of General Motors for the past 12 years, has resigned effective Oct. 15, according to M. E. Coyle, general manager of Chevrolet. No reason for his resignation was given. Holler will be retained, however, in a consulting capacity to Chevrolet on sales and merchandising problems. Thomas H. Keating, assistant general sales manager, has been named to succeed Holler.

#### Postwar Plant Expansion

Aluminum Alloys Corporation of Da troit announces the opening of an offer in Grand Rapids, at 200 N. Division & The office will be in charge of H. Gn. ham Fairchild, sales representative for that territory.

The Lincoln Electric Co. has open a direct factory branch sales office in St. Louis. The new branch, under the direction of Mr. B. J. Brugge as welding engineer and district manager of sales and service, will be located at 427 Manchester Ave.

Hercules Powder Co. has received approval, by the Reconstruction Finan Corporation, of the company's purchase of the B line nitrocellulose plant, adjacent to Hercules' Parlin, N. J. plant The newly acquired facilities will be utilized primarily to increase the production of cellulose acetate. Other cel lulose derivatives, which along with cellulose acetate are manufactured a the Parlin plant, may also be manu factured in the addition.

U

TH

EN

Oc

Sealed Power Corp., Muskegon, Mich., has completed arrangements to erect i new plant at St. Johns, Mich. Taking advantage of improvements in manufacturing methods which Sealed Power Corp. has developed recently, the St Johns plant will concentrate on the production of piston rings for manufacturers of new passenger cars and trucks. Production in the new plant is expected to start about January 1, 1946

Taylor Fibre Co. has acquired a lo cation for its previously announced West Coast plant at La Verne, Calif. Several acres, improved with a mod ern building of 12,000 sq ft of floor space, have been purchased and alterations to fit laminated plastics manu facturing processes are now finished (Turn to page 92, please)

#### Stinson Voyager 150



This new four-place personal plane built by Consolidated Vultee Aircraft Corporation's Stinson Division, will cruise at 125 mph over a 500-mile range. Powered with a Franklin 150-hp engine, it has a top speed of 133 mph and a rate of climb of 770 fpm. A new all-metal tail design adds to the plane's appearance and increases maneuverability. Wing slots make the craft spin-resistant and improved brakes assure greater landing safety. The Voyager 150 will sell for \$5,000. Deliveries will begin within two months.



on f De

Gra e fo

pened ice in ir the

er d : 4427

ed ap-

adja plant ill be pror cel with

nany

Mich. ect a aking ufac Power e St e pro ufac and ant i 1946. a loince

mod lterananu ished

#### PUBLICATIONS

Cellulosic Thermoplastics is the title of a new booklet issued by Hercules Powder Co. It contains sketches, photographs and data obtained in the company laboratories from tests on three major cellulosic materials—cellulose acetate, cellulose acetate butyrate and ethyl cellulose. The sketches and photographs are included in an effort to help the reader visualize more clearly and more quickly the degree of change in dimensions and appearance which may be expected of plastics made of these cellulosic materials, when formulated and subjected to the indicated test conditions.\*

An up-to-date price list and catalog of Airco gas welding and cutting supplies and accessories has been published by Air Reduction. The booklet contains illustrations, descriptions, engineering data and current prices. Types of equipment covered include welding rods, brazing and welding flux, hose, brazing alloys, goggles and spectacles, gloves for gas welding and cutting, etc. Also listed are carbon rods and plates, hardfacing rods, cobalt borium inserts, etc.\*

The Forker Corp. has issued an illustrated 12-page brochure on the Ohio Tramrail Systems, analyzing material handling costs and illustrating below the hook devices, a large variety of ceiling fittings, etc.\*

Pesco Products Co. has a new folder on Pesco Electric Motor Driven Feathering Pumps, Model 1E-777-AC. Included in the information is the principle of operation, cutaway drawings of the pump, dimensional drawings and performance data charts.\*

charts.\*

Chicago Forging & Mfg. Co. has published a new booklet on Sealastic Vibration Fatigue Proof Pressure Fittings for industries using metal tubing. The booklet is well illustrated with actual photographs, cross section sketches, test information.\*

Technical Bulletin No. 1130-45 has been published by Michigan Tool Co. on its new

published by Michigan Tool Co. on its new base pitch and tooth spacing checking ma-chine, designed for the faster and more accurate checking of gears.\*

Udylite Corp. has issued a new folder describing its full automatic plating ma-chine adaptable to 80 per cent of all quan-tity plating jobs. The folder features counterbalanced hydraulic tank transfer control, work carrier versatile mechanism and standard replacement parts.\*

Udylite Corp. has also issued Bulletin No. 51 describing bright nickel plating process for protective and ornamental product coating. It lists plating applications, bath formulas, operating conditions, recommended voltages and amperages for processful plating. successful plating.\*

Bendix Radio Division of Bendix Aviation Corp. has issued two booklets: (1) Bendix Automatic Radio Compass giving salient features; typical installation illustrations; performance specifications and weights and dimensions. (2) is a folder on the MS-105A VHF Broad Band Antenna.\*

Kearney & Trecker Corp. has published a new catalog, WA12, on the Milwaukee Model K Universal Spiral Dividing Head. It is fully illustrated with photographs and working drawings. In addition to a complete description of the unit, it contains instructional information as to the operation of the attachment.\*

Durez Plastics & Chemicals, Inc., has issued a new booklet containing complete technical details on the use of Durez Casting Resin. It is well illustrated with actual applications and photographs.\*

A new bulletin describing the Manhattan Extensible-Tip Splice and how it prolongs the life of Condor Endless Belts with Extended-Area Stress-Relief, has been issued by The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc. The bulletin

contains photographs of endless belt instal-lations and schematic diagrams describing the splice, etc.\* John S. Barnes Corp. has issued a new

circular on the Barnes Automatic Reciprocating Cylinder containing photographs, drawings, specifications and suggested applications. Bulletin 013-G, also by the Barnes Corp., covers pointers on installa-tion and maintenance of Barnes Hydrau-

Bulletin No. 91, by Vinco Corp., covers Vinco gear rolling inspection fixtures and master gears. It gives a clear, concise description of Vinco method of checking the backlash and runout of all types of gears.\*

A supplement to Engineering Data has been published by the Cincinnati Milling and Grinding Machines, Inc. It contains information on Hydromatic Milling Machines; 16" Series Vertical Hydro-Tel; Vertical Broaching Machines and Contour Cut-ter Sharpening Machines.\*

\*Obtainable by subscribers within the United States through Editorial Dept., AUTOMOTIVE and AVIATION INDUSTRIES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.

#### Piston Ring Manufacturers' Association Formed

The Piston Ring Mfrs. Assn., a new organization open to all manufacturers of the piston rings, has been formed in Washington, according to Frank M. Speaker, executive manager. The association will be known as the Piston Ring Mfrs. Group. Principles of the organization are to promote the best interests of the public and the piston ring industry and to encourage clean competition and ethical practices.

#### **Bugas Supplants Bennett** at Ford Motor Co.

Harry H. Bennett, industrial relations director at the Ford Motor Co., has been supplanted by John S. Bugas, former Federal Bureau of Investigation agent in Detroit. Mr. Bennett will continue as a director of the company and will serve in a consulting and advisory capacity.

#### Rustless and Armco to Merge

Mr. Charles R. Hook, president of the American Rolling Mill Co. and chairman of the board of directors of Rustless Iron and Steel Corp., announced that at meetings of the boards of directors of the two corporations, resolutions had been adopted by each board authorizing the offeers of the ". spective corporations to proceed wa the preparation of an agreement providing for the merger of Rustless into Armco, on the basis of one share of common stock of Rustless not owned by Armco, being changed into one share of common stock of Armco; such merger, subject to stockholders' approval, to become effective at the year-end.

Mr. Hook further stated that Armeo intends, after the merger has become effective, to operate the Rustless plant at Baltimore, Md., as the Rustless Iron

and Steel Division.

#### PERSONALS

Recent Appointments Among Automotive and Aviation Manufacturers:

General Motors Corp., Fleet Div., Felix Doran, Jr., Gen. Mgr. Bendix Aviation Corp., Friez Instrument

Div., Leroy D. Kiley, Gen. Mgr.
Chrysler Corp., Dodge Div., Edward C.
Quinn, Sales Mgr.
Nash-Kelvinator Corp., Nash Motors
Div., Harold D. Hornbeck, Sales Promotion

Mgr.
The Fackard Motor Car Co., Del S.
Short, Sales Mgr., Cleveland Region.
The Timken Roller Bearing Co., L. H.
Gegenheimer, Sales Engineer, Industrial

The Dow Chemical Co., Donald Williams, General Sales Mgr., and Donald K. Ball-man, Asst. General Sales Mgr. Federal-Mogul Corp., Don H. Herr, Mgr., Federal-Mogul Service.

The International Nickel Co., Inc., H. J. French, Asst. Mgr., Development and Research Div.

Metal Specialty Co., Gordon P. Reif, (Turn to page 85, please)

#### Martin Model 202



This twin-engine, low wing passenger-cargo transport was recently announced by the Glenn L. Martin Co., Baltimore, Md. It is powered by two Pratt & Whitney R-2800-28C15G engines of 2100 hp each. Cruising speed at 10,000 ft and 70 per cent of normal power is 270 mph. The plane weighs 22,023 lb empty, and is designed for a useful load of 10,976 lb. It carries 30 passengers.



Before Carpenter invented Free-Machining Stainless Steels, it was a difficult operation to produce any kind of Stainless parts from bar stock. Even the aircraft industry, small as it then was, had its difficulties trying to machine Stainless parts.

Today mass-production of Stainless parts for aircraft is commonplace. You marvel at the clean machining—the close tolerances—the high output—the low rate of rejects. Free-Machining Stainless Steels have made it possible for the aircraft industry to utilize the corrosion protection and weight saving advantages of this modern metal.

Carpenter Free-Machining Stainless Steel is serving in many vital spots in thousands

of mass-produced planes. The carburetor part shown above is just one example of the parts that can be produced with these easy-to-machine Stainless Steels.

Can you apply the advantages of Carpenter Free-Machining Stainless Steels to your new or redesigned products? Your nearby Carpenter representative will be glad to sit down with you and discuss your problems. Call him in today or write us at the mill.



IF YOU DO NOT already have a copy of our 98-page book "Working Data for Carpenter Stainless Steels", drop us a note on your company letterhead, indicating your title.

The Carpenter Steel Company

103 W. Bern Street

Reading, Pa.



October 1, 1945

TRIES

an

an tions

W ...

Ball

and

Reif,

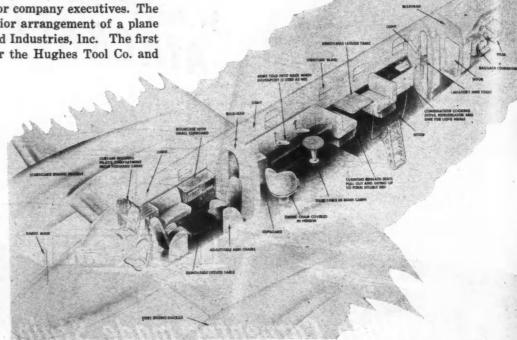
When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

53

#### **Companies Order Flying Offices**

S A peacetime enterprise Hughes Aircraft Co. has begun converting Army medium bombers into flying offices for company executives. The drawing shows the interior arrangement of a plane as designed for Gar Wood Industries, Inc. The first conversion was made for the Hughes Tool Co. and

another is being converted to the same design for the Hughes Aircraft Co. Orders for flying offices also have been placed by Henry J. Kaiser, United Drug Co. and General Motors Corp.



#### **Determining Iron Content of Aluminum Alloys**

A speedy, more accurate method of determining the iron content of aluminum alloys has been developed by chemists in the metallurgical laboratory of the Ranger Aircraft Engines plant. The method is based on the color reaction between iron and ortho-phenanthroline, a reagent which turns orange when it unites with ferrous iron.

Besides being faster, the new method is more accurate—accuracies of ± .05 per cent are said to be possible-and requires less skill on the part of the technician, making it practical to assign ordinary laboratory workers to the test.

Aluminum to be tested is dissolved in a dilute solution of hydrochloric acid and a reductant is added, the reductant reducing any ferric iron which may be formed. There is an almost complete absence of interfering ions, those which do appear being easily eliminated by filtering.

The solution, containing an excess of ortho-phenanthroline, turns orange. The intensity of the color indicates the amount of iron present in the sample of the alloy tested.

Final determination of the proportion of iron present in the alloy is made photometrically. Either a Coleman Universal Spectrophotometer (used in the Ranger tests) or other similar instruments may be used. The wavelength which produced the maximum absorption was found to be at 4900 A. Measurement of the light passing through the orange-colored solution and comparison with a standard quickly indicates the amount of iron present in the alloy. The procedure for making the photometric determination follows.

A. Reagents Required:

1. Hydrochloric Acid (HCl) (1-1): 1000 ml. HCl (C.P. SpG. 1.19), 1000 ml. distilled

2. Hydroxylamine, Hydrochloride (10%), NH<sub>2</sub>, OH<sub>2</sub>, HCl: 10 grams NH<sub>2</sub>, OH<sub>2</sub>, HCl (C.P. crystals), 100 ml. distilled H<sub>2</sub>O. Store Do not use if the solution has a brown color.

3. Ortho-phenanthroline (.25%)  $C_{12}H_8N_2$ : Dissolve .5000 gram  $C_{12}H_8N_2$  (C.P. monohydrate crystals) in 150 ml. of boiling dis-3. Ortho-phenanthroline (.25%) tilled  $H_2O$ . Transfer to a volumetric flask. Cool and dilute to the mark with distilled Store in the refrigerator. if the solution has a brown color as this indicates decomposition.

4. Standard Iron Solution (Fe): Dissolve 1.000 gram pure Fe wire in 50 ml. HCl (Conc. C.P. SpG. 1.19). Transfer to a 1000 ml. volumetric flask. Dilute to the mark distilled  $H_2O$ . 1 ml. = .1% Fe, 1 ml. = .001 grams Fe. B. Method:

Dissolve a .5000 gram sample of aluminum in 30 ml. HCl (1-1) using a 250 ml.

2. Filter into a 500 ml. volumetric flask.
Use Whatman #41 filter paper. Dilute to
the mark with distilled H.O.
3. Pipette 10 ml. of solution into a 100
ml. volumetric flask if sample contains up

to .75% Fe. Pipette 5 ml. of solution into a 100 ml. flask if sample contains over .75%

4. Add 1 ml. hydroxylamine hydrochloride (10%) and mix.
5. Add 70 ml. distilled H<sub>2</sub>O and mix.

6. Add 10 ml. ortho-phenanthroline (.25%)

7. Dilute to the mark with distilled H<sub>2</sub>O, shake we'l, let stand for at least 30 minutes. Using the Coleman spectrophotometer, set the wavelength dial at 490 (4900°A) and measure the sample using distilled H<sub>2</sub>O as a reference solution.

#### First Commercial Sale of Cyclone 18 Engines

Marking the first commercial sale of aircraft power plants since V-J Day, 2,200 horsepower Wright Cyclone 18 aircraft engines will be manufactured by the Wright Aeronautical Corp. for installation in a new fleet of Lockheed Constellation airliners. The Constellations, all Cyclone-powered, have been ordered from Lockheed by seven major airlines to provide 300 mile-an-hour luxury air transport service to all parts of the world. The engines will be built in Wright Aeronautical's New Jersey plants.

The seven airlines include American Export Airlines, Eastern Air Lines, Pan American World Airways, Pan American-Grace Airways (Panagra), Transcontinental & Western Air, Inc., Koninklijke Luchtvaart Maatschappij (KLM), and Koninklijke Nederlandsch Luchtvaart Maatschappij Indusche (KNILM). The latter two are Dutch

airlines.

## The list of Houdry licensees is the Blue Book of Refining

Here they are, the top cut of the petroleum refining industry—sixteen leading American refiners with a total of 59 Houdry and TCC units. These companies represent more than 50% of total U.S. refining capacity—nearly two-thirds of the nation's catalytic cracking capacity. Most of their Houdry and TCC plants have been converted (or soon will be) to produce automobile gasoline of far higher quality than pre-war standards, yet more cheaply than by pre-war methods.

American Liberty Oil Company Ashland Oil & Refining Company Continental Oil Company Crown Central Petroleum Corporation General Petroleum Corp. of California **Gulf Oil Corporation** Magnalia Petroleum Company

Sinclair Refining Company Socony-Vacuum Oil Company, Inc. Standard Oil Company of California Standard Oil Company (Ohio) Tide Water Associated Oil Company Sun Oil Company Union Oil Company of California

HOUDRY PROCESS CORPORATION The Pure Oil Company NEW YORK OFFICE: 115 BROADWAY, NEW YORK 6

Houdry Catalytic Processes and the TCC Process are available through the following authorized firms: BECHTEL-McCONE CORP. Los Angeles, Calif. THE LUMMUS COMPANY

E. B. BADGER & SONS CO.

New York City, New York

HOUDRY PROCESSES

October 1, 1945

(.25%)

min-

using

Day,

18 ured

for heed

ella-

neen

ajor

our arts

uilt sey

an

pij

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

55

## **Emphasis on Interchangeable Tooling** and Cutting Fluids at Tourek Plant

(Continued from page 34)

the protection of its workers. Generally speaking, a light sulfurized mineral oil supplied by Socony-Vacuum is the standard product for screw machine operations. A soluble oil is used for drilling. However, owing to the variety of materials and operations, it has been found desirable to specify spe-

cial cutting fluids for specific jobs. For example, Stuart ThredKut is used for certain tapping operations; and Socony-Vacuum SVB4 for cutting stainless steel.

For reasons of economy and for the protection of workers—to prevent dermatitis—the company has installed

a comprehensive centralized system in filtering, rectifying, and reclaiming cutting fluids. For this purpose there is a service tunnel or trough in the flow paralleling each of the primary machine lines. Oil is dumped from ead machine at regular intervals or when changing to another type of oil. This residue flows to a large settling tan from which it is pumped to a filter, the to the rectifying and reclaiming unit there the cutting fluid is heated to temperature of 185F to kill bacteria. This practice has been found to eliminate all hazard of dermatitis.

The reclaimed oil is stored in a larg reservoir from which it is distributed to the machine shop through a common pipe line. This enables the operator to draw the cutting fluid for their machines directly from a tap in the department. However, the special oil such as ThredKut are kept separately in barrels and must be drawn from the barrel as required.

It can be appreciated that small screw machine parts, produced in large volume, generally are coated with oil and fine chips. To facilitate cleaning all parts are routed to a high speed centrifuge which removes most of the cil and chips. Then the parts go through a separator in which all of the chips are blown off, leaving the parts clean and dry and ready for inspection.

Non-ferrous chips present still another problem since they must be dry for salvage. Accordingly, such chips are processed through another centrifuge to remove all traces of oil. Long and stringy chips developed on many operations are processed through a crusher which breaks them up into small pieces convenient for handling.

Quality control is an important aspect of this operation. It begins with accuracy of tool setup and constant control of tool adjustment and edge form and sharpness. Customer acceptance is assured by the operation of the inspection department. Machine operators and inspectors are provided with the necessary gages and instruments for checking each operation. One of the most useful pieces of equipment in this connection is the J & L Comparator which is employed for the checking of forms, contours and threads.

Owing to the variety of parts produced at Tourek, it would be difficult to cite specific examples of screw machine operations. However, an examination of the illustration showing a display of samples of the product will give the reader a better impression of the character of work that is done. Needless to say, the economical production of precision type screw machine parts requires ingenuity and skill that is gained only by years of know-how. These ingredients are supplied in full measure by the Engineering Department. Finally, the reader will be able to visualize this operation by examining the selected group of illustrations which were taken in various parts of the plant.



In the realm of forging design and the development of proper grain flow, Wyman-Gordon has long pioneered and has originated many forging designs which, at the time of their development, were considered impossible to produce by forging. Wyman-Gordon is foremost in scientific development—the greatest name in forging.

#### WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel
WORCESTER, MASSACHUSETTS, U. S. A.
HARVEY, ILLINOIS - DETROIT, MICHIGAN

## THIS VERDICT IS RENDERED ON YOUR INABILITY TO STOP



He didn't know how to read his speedometer!

It is really very simple. Whether a truck driver, salesman, teen-age or week-end motorist it should have been learned in school.

Just multiply speedometer reading by 11/2.

35 M.P.H.  $\times$   $1\frac{1}{2}$  = 53 travel feet per second

50 M.P.H.  $\times$  1½ = 75 travel feet per second

That's how to read your speedometer because it is your travel distance in feet per second.

Reaction, fatigue, and leg pressure all decrease your ability to stop safely ... especially at higher speeds.

VACDRAULIC MODEL 180
For Master Cylinders up to 11/4" diameter

You travel fast - you must stop quickly.

When you add Vacdraulic Power Braking to the hydraulic system of any car or truck it gives that feather touch, instant eye-to pedal-to brake action and that extra margin of safety essential to driving in congested traffic or over highways.

Vacdraulic accomplishes power braking force without action lag, and rods or links to get out of adjustment.

See your Vacdraulic Distributor or write us for details.

VACDRAULIC MODEL 240
For Master Cylinders 14" and 14" diameter

POWER





KELSEY-HAYES WHEEL CO., DETROIT 32, MICH.
Sold to Automotive Distributors by

EMPIRE ELECTRIC BRAKE CO., Newark 7, N. J.

VACDRAULIC is a Trade Mark of Empire Electric Brake Company

ng cut here i ne floo

m each

g tan er, the g unit d to acteris

a large ributed ommon eraton eraton he de al oils arately om the

small large ith oil aning, speed of the ts go of the parts

ection.

ll ane dry

chips entri-

Long many gh a

into

ng. rtant

with t con-

form nce is

spec-

h the

f the this

rator ng of

pro-

alt to chine ation ay of the charess to preis reained

e insure Fi-

alize ected

aken

RIES

#### Features of the Douglas C-74

(Continued from page 28)

V-1710 engines and cradles; or two T-9E1 tanks or a combination of two 105-mm howitzers, two ¼-ton trucks, and two crew ammunition carriers; or a combination of two 75-mm guns, two prime movers, and two crew and ammunition carriers. The C-74 will carry two complete P-74 airplanes or three complete P-39's broken down into their main component parts. Jeeps, quartermaster's trucks and cars, and 105-mm howitzers and 37-mm guns can be carried in quantities consistent with the

useful load available for the flight mission under consideration.

The floor of the main cargo compartment is designed for a maximum load condition of 200 lb per sq ft or 60 lb per in. of cabin length. The special heavy duty tie-down fittings provide for every possible stowage requirement for heavy equipment.

#### Wings

The wing is a Douglas-developed low drag semi-laminar flow airfoil section.

It has full cantilever stressed skin type construction wing, made of two spar center sections supporting the nacelles and containing the integral fuel tanks.

The six integral fuel tanks have a capacity of 11,000 gal. The outer skin, the spars and the end bulkheads make up the integral fuel tanks. Advantage of the integral fuel tank is lighter weight, in that the outer skin serves a triple purpose. It provides a smooth laminar flow surface; it acts as structure member; it is the upper and lower surface of the fuel tank, thus eliminating separate fuel cells and the supporting structure to support the fuel cells.

The leading edge of the wing is of double skin construction, to provide thermal anti-icing. The inner skin is made of very thin aluminum alloy sheet. Special Douglas rivets and dimpling methods were developed to space the skins and tie the structural members together.

The leading edge portion of the wing is constructed to provide a passage-way from the lower portion of the fuselage out to the inboard and outboard nacelles. This enables crew members to inspect and make adjustments and repairs during flight. This passageway also permits access to the main landing gear emergency release control as well as parts of the wing anti-icing heater installations during flight.

#### **Empennage**

The horizontal and vertical stabilizers are of stressed skin and stringer construction, having a double wall nose skin to permit thermal anti-icing of the surfaces. The rudder and elevators consist of a dural structure, covered with fabric and all surfaces are mass balanced. Conventional aerodynamic balance is used for movable control surfaces.

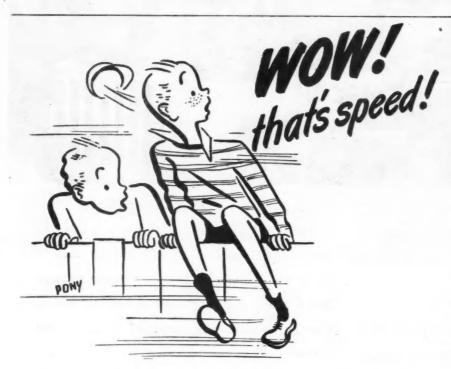
#### Flaps

The C-74 has full span flaps which represent a radical aerodynamic departure.

The full span flaps were developed from flight test experiments of representative flaps, and is probably the most efficient type of flap developed to date. The superior landing characteristics of the double slot, vane and full span improve the landing characteristics, thus giving a marked net increase in the pay load and considerably decreasing the landing speeds.

External hinges permit a simple mechanical rotation. The weight saving, which is made possible by the simple external flap supports, more than offsets the drag resulting from the fairings around the hinges and mechanism.

(Turn to page 62, please)





Write for our free booklet "Solvent Degreasing"; get the full facts about this a mazing degreasing method. There's a Blakeslee Degreaser to answer your specific needs.

In only a few seconds—clean and dry. That's the secret of the success and universal acclaim of Blakeslee Solvent Vapor Degreasers. A patented and entirely different cleaning process for metal parts and alloys giving 100% grease-free surfaces. In cutting cleaning time as much as 90%, even pores, cracks, seams and massed parts come through thoroughly clean and grease-free. This means tremendous savings in production costs.





is cin as as nd us he

of ide is loy

ng che utew sthis che

ng

ng

ers

n-

)Se

he

ed

ass

Ir-

ch

le-

ed

he

er-

ull is-

ise

ole

he

he

nd

ES

# THERE MUST BE NO COMPROMISE WITH

In the months ahead, motor transportation faces a mighty task. Straining to meet unprecedented peacetime demands, American industries are in urgent need of equipment; machinery and supplies. Loads that fail to get through on time will not only upset production and sales programs for these industries — but mean losses in revenue to trailer operators. Delays due to accidents caused by ineffective brakes must be prevented — there should be no compromise with safety.

Protect your drivers, your cargoes, and your trailer outfits — give them the EXTRA SAFETY of Controlled Braking Power — exclusive feature of Warner Vari-Load ELECTRIC Brakes. No matter what the weather, the driver can pre-set any and all brakes to fit BOTH load conditions and road conditions — thus keeping his train straightened out and under full control even when the going

is slippery. Costly tie-ups due to damaged equipment are therefore avoided.

On all future trailer purchases, specify Warner Vari-Load *Electric* Brakes — world-famous for safety, simplicity and dependable, trouble-free performance.





NOW — Present Owners of Trailers with Warner Electric Brakes Can Have This New WARNER CONTROLLER

The new Warner Controller — simple and compact — synchronizes the hydraulic brakes on tractor with the Electric Brakes on trailer. The tractor's regular foot pedal operates both braking systems. This development creates smooth foot-touch tractor-trailer braking under all conditions—eases driving strain—assures greater safety. Controller is easily and quickly fitted into hydraulic brake line. See your Warner dealer about changing over your present equipment.

FOOT PEDAL PRESSURE CONTROLS BRAKES ON BOTH TRACTOR AND TRAILER



The landing gear is the tricycle type employing dual wheels. Main gear wheels are equipped with 65 in diameter tires. The tread (distance between main gears) measures 34 ft 2 in., the wheel base (distance between main and nose wheels) is 37 ft 3 in. The nose gear wheels are mounted on a common axle and are equipped with 44 in. diameter tires.

The landing gears are fully retractable. Should the need arise in flight, crew members may operate the mechanism to extend the gears manually by means of auxiliary controls located in the nacelles and nose section for the main and nose gears respectively. As a safety consideration, the retracting mechanism is so designed that no power except that provided by gravity is normally required to lower and lock the three undercarriages into safe landing position. However, in the event that some unforeseen obstacle prevents the gravity extension, emergency hydraulic power is available. To provide easy ground handling, the nose wheel is equipped with a hydraulic power steering system. The airplane's turning radius is approximately 19 ft when the airplane is being taxied and less when the airplane is being towed.

Hydraulic power brakes complement the steering and reversible pitch propellers to give the pilot complete control of the taxiing airplane. Braking is equalized by the pilot through differential control allowing application of either right or left hand brake.

The four brakes have the capacity to absorb and dissipate 34,000,000 ft-lb of energy or the equivalent of stopping the fully loaded airplane from a speed of 85 mph in a distance of 415 ft. In addition to the hydraulic brakes, a completely independent airbrake system is provided for emergency use.

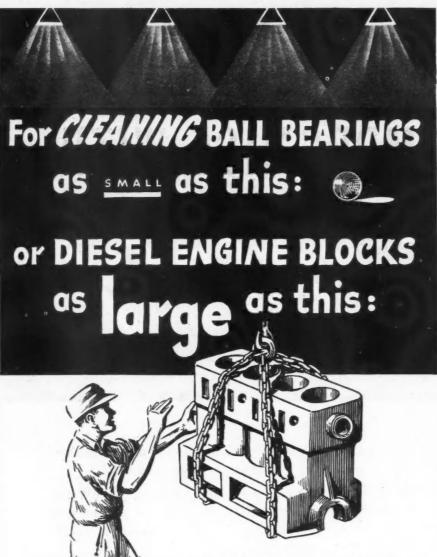
Landing gear retraction, steering, cargo doors, and brakes are powered by means of the 3000 psi hydraulic system. While in flight the system pressure is reduced to approximately 250 psi.

#### Power Plants

The C-74 Globemaster is powered by four Pratt and Whitney, Wasp Major R-4360 engines. Each engine has 28 cylinders in four banks.

The upper and lower anti-drag ring segments are rigidly supported from the nacelle structure in order to relieve vibration troubles. The upper section of the anti-drag ring accommodates the air induction system and the lower anti-drag ring accommodates the oil cooler duct. The anti-drag ring is composed of six sections in which the four side sections are very easily and quickly removed from the airplane for servicing. No part of the anti-drag ring is supported from the engine.

The airplane is equipped with either (Turn to page 64, please)



GREAT STRIDES in the cleaning of Diesel motor blocks have been made, especially during the past few years, by A-F Engineers.

Not "just washing machines", A-F machines that remove all chips from Diesel motor blocks or clean out 230 holes and all six sides of a Diesel motor block simultaneously—are as highly specialized pieces of equipment as any precision instruments now in your plant.

Write today for new postwar folder showing "How 7 Famous Companies Solved Their Metal Products Cleaning and Finish-

ing Problems" — or write, without obligation, for a discussion of your metal products cleaning problems — today.

#### THE ALVEY-FERGUSON COMPANY

Offices in Principal Cities, 27 Disney St., Cincinnati 9, Ohio



THE ALVEY-FERGUSON CO. OF CALIFORNIA
P. O. Box 396, Vernen Branch,
Les Angeles 11, California







type gear in. ance 4 ft be-7 ft untped re-

in

the

anus lotion

iverethat by wer into the acle ner-To nose ulic ne's 9 ft and wed. nent proconking diftion city ft-lb ping peed In omn is ing, ered sysres-250

ered asp has

ring

rom

ieve tion ates wer oil

g is

the

and for drag

ther

RIES

four-bladed Curtiss or three-bladed Hamilton Standard propellers of the reversible pitch type. Their diameter is 19 ft. A safety device connected with the landing gear prevents the propellers being reversed except when the airplane is on the ground for ensuring shorter landing roll. With the reversible pitch propellers, the plane can be taxied backward.

An auxiliary power plant is located in the right hand outboard nacelle for supplying the power for the cranes, starting of engines and supplying emergency electric power in case of any failure of the ordinary electric supply. A 30-gal alcohol tank is located in the lower front fuselage section for propeller and carburetor alcohol anti-icing.

The power plant elements electrically controlled are cowl flaps, oil cooler exit flaps, carburetor air filters, fuel booster pumps, oil transfer (portable pump), auxiliary power plant throttle control and auxiliary power unit air coling scoop.

The C-74 is supplied with a CO<sub>2</sub> fire extinguishing system. This fire extinguishing gas may be released upon indication of fire by warning lights flashing at the flight engineer's sta-

tion. The engine, engine accessory section and nacelles may be flooded with CO<sub>2</sub> in any nacelle or engine section selected by the flight engineer.

nd th

for the

ir flo

plates

leterm

for th

the re

unit a

duct &

obtain

the ho

The

detern

to air

of the

same :

fer co

the un

with !

air o

were

the a

tained

serve

strum

sible.

sults

Fis

vs Re

tubes

tubes

lishe

reach

pears

numl

is no

tened

3500

tube

lent

2000

Th

tube

The

tube

sam

regi

tene

the

ting

pas

ang

selt

the

sho

side

nol

hyd

pas

a r

sul

als

for

0c

#### Tooling

The assembly jig for the center wing section is 122 ft long and 22 ft high and permits 50 people to work on the center wing section at the same time. This jig alone required 32,000 manhours to design and took 150 tons of structural steel to make.

The wing is built in a vertical position, with the leading edge down, and is removed from the jig by two dollies secured to the inboard nacelles. The wing weighs approximately 20,000 lb. After it is removed from the jig by the dollies, it is moved on rails to two large turning towers which pivot it into the horizontal flight position.

Tooling for the laminar flow type wing presented many new problems because of the extremely close wing surface tolerances. The conventional airfoil is tooled from the inside of the wing, whereas the assembly jigs on the C-74 were designed to control the outside surface as well as all internal structure.

The fuselage assembly jig required 895,000 lb of structural steel. and 1218 assembly tool drawings. Jigs for the frames and bulkheads were constructed to provide two floor levels for workmen. The jigs are circular in shape, 15 ft in diameter and provided with a turning mechanism to allow access to all portions of the jig.

The tail stub, ordinarily a small portion of an airplane, required three stories of work stands, and the tail cone, usually a floor jig, required two stories.

#### Willow Run Leased to Kaiser-Frazer Corp.

Kaiser-Frazer Corp., newly formed automobile concern headed by Henry J. Kaiser, West Coast shipbuilder, and Joseph W. Fraser, president and chairman of the board of Graham-Paige Corp., has leased the main manufacturing building at the Willow Run bomber plant for a five-year period. The building contains 2,650,000 sq ft of manufacturing floor space and approximately another million sq ft of mezzanines and balconies. According to RFC sources, the deal is ready for consummation, pending the approval by SEC of a reported \$18 to \$20 million stock issues. The building would be used for production of the Kaiser car, a low priced vehicle, and the Frazer, a medium priced car. Clearance of the plant is already nearing completion and occupancy probably could be given in some-thing under 90 days, according to best estimates. It is understood that the company submitted figures to RFC indicating that employment will reach about 20,000 at full production.



#### **Intercooler Tube Design**

(Continued from page 42)

had passed through the mixing boxes and the temperatures were corrected for the known loss in the boxes. The hair flows were measured with orifice plates for the lower air flows and were determined from unit pressure drops for the higher air flows. Because of the relatively high resistance of the unit as compared with that of the duct a uniform flow distribution was obtained in both the cooling air and the hot paths.

sec-

with

tion

ving

nigh

the

ime.

lan-

of

ogi-

and

The

lh.

by

two

nto

ype

ems

ing

the

ut-

na

218

the

ted

ft

rn-

or.

ail

red

nd

irige

ır-

er

ld-

ıu-

ely

nd

es,

n,

re-

es.

ed

m

is

u-

10-

st

ES

The first series of tests was run to determine the heat transfer coefficient to air passing inside the tubes. Each of the three units was treated in the same manner. To determine heat transfer coefficients to air outside the tubes, the units were operated as intercoolers with hot air inside the tubes and cool air outside the tubes. The air flows were varied throughout the range of the apparatus. The flows were maintained until steady conditions were observed at all points and then all instruments were read as rapidly as possible. An explanation of the test results follows:

Fig. 6, which shows Nusselt number vs Reynolds number for flow inside the tubes, indicates that for the round tubes fully turbulent flow is not established until the Reynolds number reaches 8000 and that laminar flow appears to continue up to a Reynolds number of about 2500. In contrast it is noted that turbulent flow in the flattened tubes starts at approximately 3500 Reynolds number. The dimpled tubes appear to maintain fully turbulent flow from a Reynolds number of 2000.

The graph shows good correlation between the round tubes and flattened tubes tested in both the fully turbulent and fully laminar flow regions. The dimpled tube curve and the common curve for round and flattened tubes each have approximately the same slope in the fully turbulent flow regions, namely 0.82. It will be noted that the curve for dimpled tubes lies 26 per cent above the curve for flattened tubes.

Fig. 5 shows the film coefficient inside the tubes for all three units. In plotting Fig. 6 the lines in Fig. 5 which pass through the points marked by triangles were used to determine the Nusselt number. The method of obtaining these points will be explained. Fig. 7 shows the heat transfer coefficients outside of round tubes. In this plot Reynolds number has been based on the hydraulic diameter of the diagonal passes between the tubes instead of on the tube diameter in order to provide a more direct comparison with the results of the tests on the dimpled tube unit in which the Reynolds number is also based on the passage available. It may be noted that the points plotted for a Reynolds number value of 3900

inside the tubes fall consistently below the average of all the other test points. It was therefore assumed that the steam test points at Reynolds number values of 3450 and 4300 inside the tubes were in error since these were based on two runs, whereas the intercooler result is based on 10 runs. By assuming outside coefficients at each of the cooling air flows as read from the average line of Fig. 7, the inside coefficients were recalculated and aver-

aged and this average was plotted as the intercooler test point at a Reynolds number value of 3900, shown on Fig. 5. The same procedure was used in obtaining the intercooler test point for the dimpled tube unit shown at a Reynolds number value of 1300 on Fig. 5.

Fig 8 shows heat transfer coefficients vs Reynolds number for air outside the dimpled tube unit. In this case the arrangement of the dimpled tubes is such that an approximately straight passage of rectangular cross section is provided for air outside the tubes. It will be noted that the slope of the line

(Turn to page 68, please)



## And now.... EQUIPMENT FOR THE AIRPORT

Since 1932, we have manufactured tens of thousands of welded tubular assemblies and forgings for aircraft . . . building precision-made parts for most larger aircraft producers.

Now, we also are manufacturing many articles of Ramp and Hangar Equipment for the Airlines . . . "ground" equipment so necessary in keeping vital wartime air traffic "on the move."

Requirements of Ramp and Hangar Equipment manufacturing for the Airlines are varied. Only a few items are of standard design and specification permitting the economies and improvements possible in production line procedure Whether the need is of individual or standard specification, we are fully staffed and equipped to produce as ordered.

A letter of inquiry from you will bring you full information regarding Airlines' "Equipment for the Airport," now!

BUY UNITED STATES WAR BONDS AND STAMPS

### \* AIRCRAFT MECHANICS \*\*\*

COLORADO SPRINGS, COLORADO

DESIGNERS \* \* \* ENGINEERS \* \* \* MANUFACTURERS

#### **OUT OUR WAY**



PREVENTION is always the best medicine for any ailment ... and for slick, sick floors and surfaces the best precaution is Speedi-Dri! Speedi-Dri, the oil-thirsty, granular absorbent, lays a carpet of safety under foot, while soaking up oil and grease. It does its work ... while you work in safety!

Speedi-Dri saves valuable man-hours in floor-maintenance. No expensive machines required . . . no trained personnel. Anyone can use Speedi-Dri, quickly and easily. Just spread it around . . . and improve your standing.

Sweep it up with an ordinary, stiff broom . . . and you've got safe, clean floors. It's that simple. In addition, Speed-Dri eliminates the danger of "flash-fires" on greasy, oil surfaces . . . for Speed-Dri will not readily burn, even when oil-soaked!

Pin your card to this advertisement and mail today for full details and a generous sample of Speedi-Dri.

SUPPLIERS: East—Safety & Maintenance Co., Inc., New York 1, N. Y.
South, Midwest & West Coast—Waverly Petroleum Products Co., Philadelphia 6, Pa.



in the turbulent flow region is approximately 0.8 as compared to a slope of approximately 0.6 with the round tube unit. This would seem to indicate that with this type construction heat transfer coefficients outside the tubes should be computed on the same basis as for flow inside the tubes.

There is seen to be a rather large spread of points in the higher values of Reynolds numbers in Fig. 8. However, this spread does not indicate a very large experimental error. If heat transfer coefficients outside the tubes are read from the curve of Fig. 8, and heat transfer coefficients inside the tubes are read from Fig. 5, and the overall heat transfer coefficient is computed for each of the test points, it is found that the computed heat transfer coefficient has an average variation ± 5.0 per cent from the values obtained in the intercooler test. It is probable that these coefficients for air outside dimpled tubes are too high and it is hoped that further work can be done on this subject.

m

Fig. 9 shows heat transfer coefficients inside the tubes plotted against the air pressure drop corrected to a standard density of 0.07651 lb per cu ft at the center of the unit. This air pressure drop is the overall pressure drop as measured by static fittings located on the sides of the ducts four in. upstream and four in. downstream of the test unit as shown in Fig. 3.

As a result of these tests, the following conclusions are drawn: (1) The transition from laminar to turbulent flow extends over the Reynolds number range of 2000 to 8000 for small round tubes. If the tubes are flattened the transition region extends only from Reynolds numbers 2000 to 3500, while if the flattened tubes are dimpled the transition takes place at Reynolds number 2000. (2) Flattening a round tube increases the heat transfer coefficient substantially. Dimpling the flattened tube increases the heat transfer coefficient to an even higher value. (3) For the same air pressure drop dimpled tubes have the same or higher heat transfer coefficient than round tubes, while plain flattened tubes have a lower heat transfer coefficient, except at very low air pressure drops. (4) The use of dimpled tubes in intercoolers permits a reduction in the amount of cooling air required and therefore leads to a lower drag on the airplane.

#### Announcements of New Car Prices Delayed

Current labor strife in Detroit has put a damper on announcements of new car prices by automotive companies. Since the price formula provided by OPA does not allow for increases in wage rates that are not due to government direction, the industry is holding off to await the outcome of the wage settlement efforts being made by conciliators for the Labor Department.

## How 2+4=64% or More in Tape Cost Savings

If you are a substantial user of industrial tape, wouldn't you be delighted to achieve handsome savings in material and manpower cost through one or more of the following four conservation methods:

oxi-

tube that ansould

for

lues ow-

€ 2

neat

and

the

the om-

t is

ins-

tion

able

side t is

one

ents the nd-

at res-

rop

ted up-

the

fol-The

ent

ber

ind the

mo

nile the

ım-

ıbe

ent

effi-

Por

led eat

es.

8

ol-

ore

ne.

88

ew

by in

n

ge

n

ES.

- Use of a tape which is more efficient than one now in use, but which costs no more.
- 2. Use of a tape just as efficient as one now in use, but costing less.
- 3. Use of narrower width of tape which is nevertheless just as efficient as one now used.
- 4. Use of shorter pieces of tape than now used, but long enough to do the job just as efficiently.

#### Here Are the 2 Reasons Why

Bauer & Black technicians have been saving firms as high as 73% in tape costs alone . . . and through the four conservation principles just named.

- Bauer & Black Cloth Industrial Tapes cost less than most other industrial tapes.
- Bauer & Black Cloth Industrial Tapes have greater tensile strength than many other industrial tapes.

HERE'S JUST ONE EXAMPLE: In a large Detroit industrial plant two strips of 1-inch paper tape were being used with an overlap to protect gas tank doors. They were replaced with a Bauer & Black Cloth Industrial Tape only 1½ inches wide, and because of its greater tensile strength requiring only one strip. Result—savings in tape cost of 64%.

Altogether, eight applications of tape were made in this one plant with substantial savings not only in tape cost but also in manpower cost.

#### Why Not Check Your Own Tape Use?

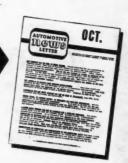
Bauer & Black technicians will be glad to call and study your tape problems with your engineers. There isn't the slightest obligation. Write today to Dept. 310 and tell us when to call. This free service may disclose a number of ways to save money and increase operational efficiency.



## BAUER & BLACK Industrial Tape

#### Send for Bauer & Black Automotive News Letter

This timely new service will keep you informed on latest developments, trends and ideas in the automotive industry... facts which vitally affect your business. Here, in easy-to-read, timesaving form, you get the highlights of the month's news and forecasts! Send your name and address today. It's free and there is no obligation.





A product of

#### **BAUER & BLACK**)

Division of The Kendall Company

2500 SOUTH DEARBORN ST., CHICAGO 16, ILLINOIS

RESEARCH TO SPEED AND
IMPROVE METHODS...
PRODUCTION SHORT CUTS
TO REDUCE COSTS

\* \* \*

#### **New Production Equipment**

(Continued from page 35)

said to assure more dependable service and greater thread accuracy.

The major improvement of the Type LL Landex over the Type L Landex head is the use of latch blocks which take the place of the locking ring in the Type L head. The latch block abutments are readily reground after they have become worn in service, making a quick and economical means for repairing the die head. The latch blocks in this head are positioned in the adjust-

ing ring. The abutments contact the back face of the closing ring in latching the head in the closed position.

The Type LL Landex head comprises four major parts whereas the Type L Landex head had five major parts. The chaser holders for the Type LL Landex heads are interchangeable with the chaser holders employed with the L Type Landex head.

The Type LL Landex head is now available in the %-in. and %-in. sizes.



Type LL Landex head

NEW 26-in. universal hydraulic vertical gear grinder for both spur and helical gears, has been announced by Pratt & Whitney, Division Niles-Be ment-Pond Co., West Hartford, Conn. The machine is capable of handling gears up to a maximum outside diameter of 30 in. with a maximum diametrical pitch of 2 and a minimum diametrical pitch of 12. It will handle helix angles, either right or left hand, up to 35 deg, and a maximum width of gear face of 10 in. Indexing means are provided for grinding gears with numbers of teeth ranging from 5 to 190 inclusive, except for a few prime numbers above 83.

The machine produces involute profiles by rolling the pitch circle of the

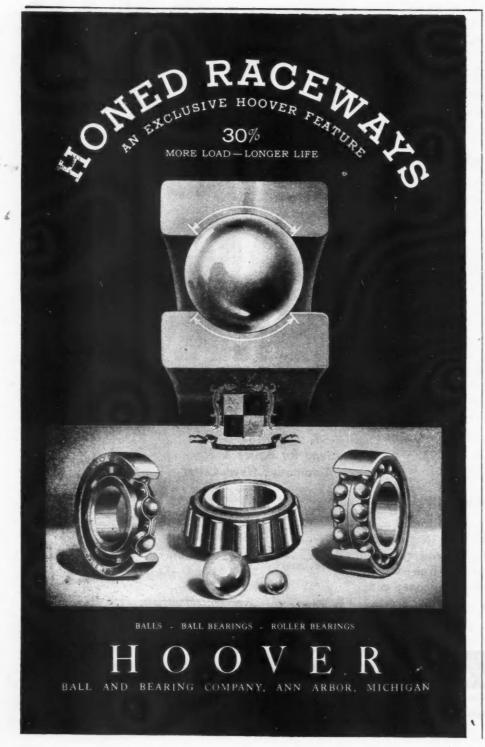


P & W 26-in. universal hydraulic vertical gear grinder

gear being ground upon an imaginary pitch line. The rolling of the pitch circle is in a direction perpendicular to the gear axis, and with a gear tooth in contact with a V form grinding wheel which simulates one tooth of a generating rack. The grinding wheel is mounted on a ram or wheel slide which reciprocates in a direction parallel to the gear axis.

The 26-in. gear grinder is a vertical machine whose motion most nearly resembles a vertical shaper. It has a vertical work axis, and a vertically moving wheel slide.

A system of change gears is used to produce the rolling generating motion of the gear being ground. The work is mounted on a rotary table and rotated by a worm and wheel. This rotary table is supported on a carriage which is moved in a direction perpendicular to (Turn to page 72, please)





October 1, 1945

c verir and ed by es-Be-Conn, adling diamamet-

helix up to gear

mbers inclumbers

f the

lic

nary pitch

ar to

tooth

ding

of a

eel is

el to

tical

y re-

ver-

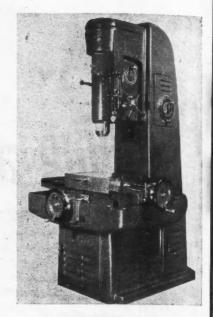
ed to otion rk is tated table h is ir to

RIES

the work axis by means of a screw. The relative rates of motion of the rotary table and the sliding carriage determine the rolling or generating pitch diameter of the work. Change gears connect the pitch screw to the table worm. The change gear ratio can be altered to cover the range of pitches, pitch diameters and tooth numbers. Indexing is obtained through a one-tooth clutch in the change gear train driving the rotary table. During the return of the carriage, this clutch withdraws and rotates one or more turns which alters the rotative position of the work. A telltale lamp indicates the operation of this one-tooth clutch.

THE Kearney & Trecker Products Corp., Milwaukee, Wis., has just completed the new Model C Milwaukee Autometric boring machine. This machine will handle a wide variety of precision boring from the finest tool room work to precision production jobs.

Bed column, and chip guard are cast in one unit. A stationary boring spindle head is mounted on the machine column, thereby providing an extra long bearing for the spindle quill. The construction of the head, spindle, and quill permit sufficient quill travel to take care of the entire vertical range of the machine without increasing the over-all machine height. This feature reduces



Model C Autometric boring machine

the number of sliding members. Coupled with a single lever directional control to quill feeds and power rapid traverse movements this reduces setup and operating time. Accurate means are provided for gaging depth of quill movement to as many as four positions.

A 1-hp motor mounted in the base drives the spindle. Power transmission is by direct multiple V-belt drive to the spindle at all speeds. The rapid traverse mechanism to the quill is powered by a ¼-hp motor which operates only while the quill is being rapid traversed.

The precise transverse and longitudinal movements of the table are effected by precision measuring screws equipped with large-diameter micrometer dials and verniers graduated to read to .0001 in. Mechanical counters are set at zero during the initial setup giving the table position in inches and tenths of an inch.

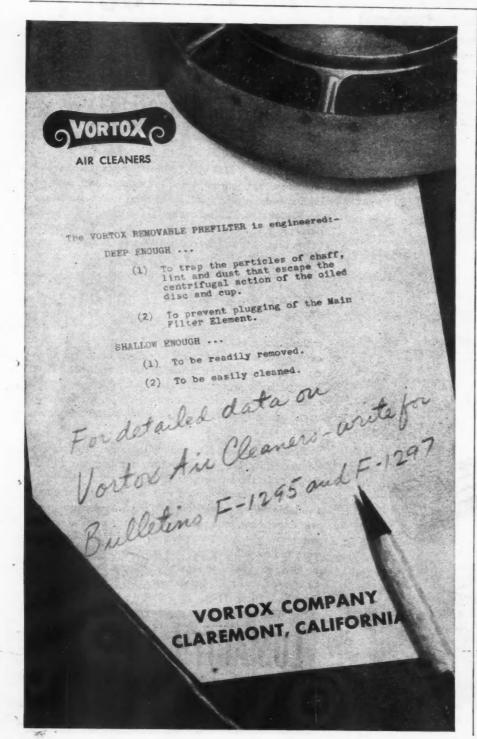
d

An efficient lubricating system is provided with metered circulating oil to most running parts including the superprecision spindle bearings. After the lubricant has passed through the spindle bearings, it is collected in a small reservoir at the lower end of the quill from where it is returned to the main reservoir by an aspirator pump. This prevents oil leaks at the spindle nose.

Many single point thread grinders can be converted to multi-ribbed wheel work by means of the new semi-automatic diamond dresser made by the Sheffield Corp., Dayton, Ohio.

The Sheffield semi-automatic diamond dresser is mounted between centers of the grinder and is actuated by the driving pin on the face plate. A precision ground cam for the required pitch is mounted upon an accurately ground and lapped spindle and controls the movement of a suitable diamond. The

(Turn to page 76, please)





For information on Yoder mills designed to your particular production problem, consult a Yoder engineer in your area.

upled rol to verse operpronove-

base ission the o tra vered only ersed igitue efcrews erom-

ed to

nters setup

and

prooil to uperhe luindle res from

eser

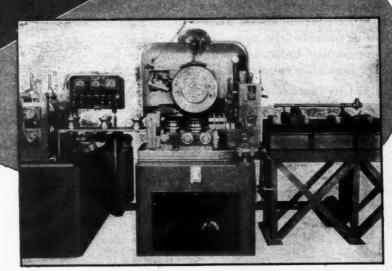
pre

nder ibbed semiy the mond rs of driv-

cision ch is cound

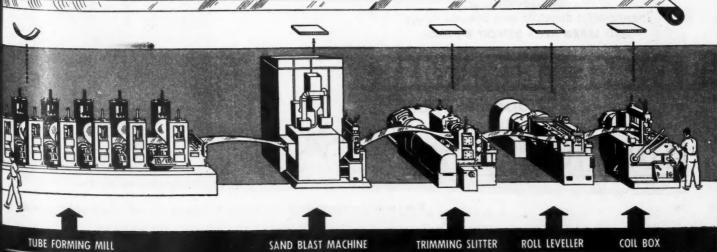
the

TRIES



YODER COMPA

5518 WALWORTH AVE. 2, OHIO



SAND BLAST MACHINE

TRIMMING SLITTER

ROLL LEVELLER



More than twenty years ago Chace developed and introduced thermostatic bimetals made of nickel-chrome steels, which had a longer life at high temperatures than earlier type bimetals made of other alloys.

As a result, the manufacturer of temperature responsive devices was enabled to get a more lasting actuating element and, in consequence, to produce a dependable and more enduring appliance or control. Chace Thermostatic Bimetal thus became "the heart" of many leading temperature indicating and controlling devices whose sales volume steadily increased.

Developed in years of peace, Chace bimetals became vitally important in war, as did the knowledge of our engineering and fabricating divisions, in the application of bimetal to many precision controls.

This knowledge—now fortified by additional hard-won experience—will again be freely offered to manufacturers wishing to refine present designs or to bring out new developments.



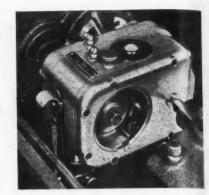
Thermostatic Bimetals and Special Alloys 1610 BEARD AVE • DETROIT 9, MICH.

CHACE BIMETALS

one of which should precisely fit your needs

SOLD IN SHEETS, STRIPS and FINISHED FORMS

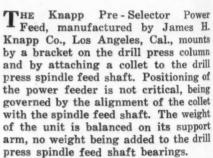




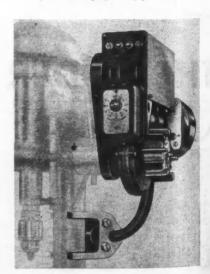
Sheffield diamond dresser

reciprocating movement of the diamond in conjunction with the uniform lateral motion imparted by the leadscrew results in the desired wheel profiling action.

This precision dressing device is recommended by the manufacturer for use on: Work demanding long lengths of thread and where the breakdown of a single point wheel necessitates making a number of passes; thread gage grinding for elimination of thick first and last threads; maintenance of minimum lead variation; all fine pitch threads over 32 tpi; where the wheel is to be dressed at the required helix angle; and where it is desired to traverse grind and the sharp corner and small radii exceed the limits of crush dressing.



In operation the Knapp Pre-Selector (Turn to page 78, please)

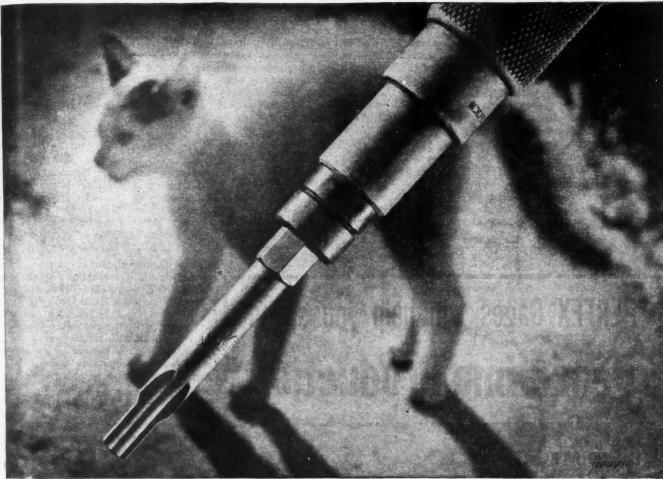


Knapp Pre-Selector Power Feed









TYPE "A" ASSEMBLY BIT

reng

ise of a ng ndnd ım be nd nd dii

rer H. nts nn

ill

of

ht

ort

ill

or

## The Multiple Life of this CLUTCH HEAD Type "A" Bit . . . unlike the fabled "nine"

of the feline species . . . is definitely beyond all conjecture.

Time, and time, and time again, this tool is fully restored to its original efficiency by a simple 60-second application of the end surface to a grinding wheel.

Each repeated grinding sends it back to the assembly line with a new lease on life . . . to MULTIPLY BY THOUSANDS the number of screws driven per bit.

Here is tool economy that CLUTCH HEAD alone can deliver . . . economy that is unmatched with any other screw on the market.

Here is freedom from the expense, bother, and delay involved in "back-to-the-factory" shipments for reconditioning.

And here, too, is a tool so ruggedly engineered that it stands up through a longer "spell" of continuous driving, free from change-off interruption.

But standardization of your assemblies on CLUTCH HEAD Screws gives you other advantages for faster, smoother, safer, lower cost production:

- The safety of automatic Center Pivot entry for straight non-slip driving.
- All-square contact for effortless driving with freedom from end pressure to combat ride-out as set up by tapered driving.
- CLUTCH HEAD's positive Lock-On for easy one-handed reaching.
- Simplified field service because CLUTCH HEAD is the only modern screw designed for operation with the ordinary screwdriver.

You are invited to make your own test of these and other exclusive advantages by asking us to mail you



a package assortment of CLUTCH HEAD Screws, sample Type "A" Bit; and fully Illustrated Brochure.







UNITED SCREW AND BOLT CORPORATION CLEVELAND 2 CHICAGO 8 NEW YORK 7 Power Feed provides timed, reversible, adjustable torque with automatic start of the cycle and automatic stop. It retracts the drill for full chip clearance at a pre-selected point. When used with any standard tapping head, the unit becomes an automatic tapper. The tap is lifted high enough for chip clearance, but not completely removed, which is of particular advantage in blind tapping when a chip driver ahead of the tap is a disadvantage. The unit is used also for honing, lapping and reaming.

A N ALL-STEEL conveyor belt, made on a new principle in which a series of steel plates are linked together at the ends, is a recent development of the Steel Parts Manufacturing Co., Chicago, Ill. The belt is driven by a drivesprocket that meshes with the hinges of the belt, providing a positive non-slip movement. There is no sag at any point along the belt length, and no open spaces between links, so that a flat working surface is presented at every point.

The only exposed moving part is the belt itself. The drive sprocket and motor are enclosed, and the edges of the belt are provided with a guard rail.

Each one of the new conveyors is engineered to the specific job it is to do. Belts are available in varying widths



All-steel conveyor made by Steel Parts Manufacturing Co.

and lengths to suit virtually every requirement. The factors taken into consideration in the individual design of the belt are: Weight and size of the object to be carried; distance to be traveled; and speed of operation.

COMMANDER MANUFACTURING Co., Chicago, Ill., is making a six-spindle, universally-adjustable drilling attachment named the Multi-Drill. This new attachment can be installed on most types of drill presses. It comprises a driving head with six movable spindles, each of which is located by an individual radially adjustable arm. This design permits the positioning of drills up to 17/64 in. diameter in any hole pattern, including a straight line, within a 5-in. diameter circle with minimum distance between centers of 11/16 in. From one to six holes can thus be drilled in one stroke of the drill press.

The housing for drive gears, and the supporting frame and adapters, are of special high strength aluminum alloy. The entire attachment weighs 13 lb. Modifications of this attachment are obtainable for special applications.

#### Oldsmobile Increasing Production Facilities

Oldsmobile Div. of General Motors is stepping up production facilities in all departments in expectation of an annual output of 450,000 cars a year at full production. It presently is expanding its pressed metal facilities by more than 65,000 sq ft, and is erecting a new two-floor materials and receiving and shipping building 60 by 548 ft. The division also will have for use in automotive production for the first time the new forge plant acquired in 1940 and expanded in 1944 to approximately 500,000 sq ft. It was used for production of shell casings and other forgings during the war, and now will supply Oldsmobile with all its automotive forgings as well as allied divisions of General Motors.

#### C. E. Wilson Selected

Charles E. Wilson, president of General Motors, is reported to have been selected by the automotive industry as its representative in the forthcoming labor management conference in Washington. The meeting between government, labor, and management is expected to get underway in late October or early November.

MAL DR

Octo





#### ELECTRIC WELD TUBING

#### PUTS STEEL AT YOUR SERVICE IN MANY USEFUL WAYS

The conversion of long strips of sturdy steel into light, strong, durable tubing by the electricweld process demonstrates anew the adaptability of this most versatile of our metals to an infinite variety of equipment, articles and accessories.

The alphabet of applications of electric-welded tubing runs from "A" for automotive parts (of which there are fifty-seven) to X-Ray equipment and back through bicycles, irrigation lines—adapted in war to invasion lines for conveying water, gasoline and oil to the fighting fronts—and on to office and playground equipment, furniture and washing machines.

Steel tubing affords great strength with little weight. It can be fashioned in all manner of shapes by many methods of manufacture. It will readily help make up the deficiency of appliances and machines that war's demands for steel denied us. It offers a challenge to the imagination and ingenuity of designers, engineers, and manufacturers to employ it in the creation of new and useful and attractive articles of steel to make our daily living safer, more comfortable and convenient.

#### **JONES & LAUGHLIN STEEL CORPORATION**



A .... A .... A .... A ....

CONTROLLED QUALITY STEEL FOR PEACE



SHAL DRAWING AND SKETCHES MADE AT JAL ELECTRICWELD TUBE PLANT, OIL CITY, PENNSYLVANIA, BY ORISON MACPHERSON

#### TUBES OF STEEL

Swift and accurate is Electricweld method of forming steel tubing. Coils of flat steel strip are fed into the forming rolls (see illustration) and move along until they are perfectly cylindrical in shape. Then they pass under two rotating electrodes, where, as the butted edges are pressed into contact, electric current flows through the steel, welding the seam and forming a solid wall; strong, yet light. Controlled Quality strip from J&L Strip-Sheet mill assures correct wall thickness, concentricity, and accurate size in the finished tubing.

Steel tubing's sheer beauty outranks that of any other building section, allowing architects wide latitude in combining utility with a distinctive decorative note in the design of all manner of buildings, from residences and apartments to hotels, office buildings, stores and schools. Metal working plants in America today use steel tubing to achieve results in beauty and usefulness undreamed of a few years ago. Tubing can be bent, beaded, expanded, swaged, spun, flanged, upset, grooved, fluted, flattened and otherwise altered in cross section to meet various design requirements.

Steel shell containers to protect ammunition in transit were produced in J&L Electricweld Tube Plant in Oil City, Pa., at the rate of 400,000 per month.

"Steel-Bellied snokes" our troops called the electric-welded steel tubing, adapted to invasion pipe lines, twisting over the land to convey gasoline, oil and water to the fighting fronts. Steel tubing, in 20 ft. sections, 4 in. in diameter, was coupled with a special coupling that enabled men to lock two lengths together in 1 minute. A light truck could carry 1000 ft. of tubing. Two men could handle a length and 20 miles of pipe could be laid in a day. In Africa alone, 1000 miles of this invasion line were in operation. The 4-in. line could deliver 210,000 gals. a day. The 6-in. portable line had a capacity of 400,000 gals.

First pipe for invasion line came from J&L Electricweld plant. Peace-time possibilities are for increased use in irrigation of farms, orchards, truck gardens, as a means to controlled food production, as well as to offset normally arid conditions.

Tubing for furniture, bicycles, conveyors, handles, and playground equipment will now again be produced in large quantities at the I&L Electricweld plant.

57 tubular members in an automobile include air intake; oil filler and breather tube; radiator inlet and outlet tube; manifold tube; accelerator shaft and pedal tubing; exhaust and tail pipe, propeller shaft and torque tubes. Accessories include tire pumps and grease guns.

on-

of

the

be

hi-

ile,

ch-

lew

ost

3 8

de

at-

nin

ım

he

of

oy.

all

n-

re

ew

nd

di-

he

ly

ıc-

ly

This two-place, side-by-side, dual controlled light plane features starter, battery, generator and lights, in addition to two-position propeller, wing slots and trim tabs. Powered by an 85 hp Continental horizontally opposed type engine, the ship is expected to cruise at 105 mph with a top speed of slightly over 115 mph. Cruising range is 700 miles. Built by Commonwealth Air-craft, Inc., of Kansas City, Kan.





#### "Die-Less Duplicating" Eliminates Time Loss and Die Expense!

The Di-ACRO Bender is a precision unit, designed to form and duplicate an unlimited variety of parts and pieces—eliminating, in many cases, the need for special dies. Tubing can be accurately formed with the DI-ACRO Bender to a center line radius as small as 2½ times the outside diameter of the tube without distortion. Shapes and outlines, impossible to obtain with regular production dies. impossible to obtain with regular production dies, are easily formed with the DI-ACRO Bender. These include, round, half-round, hexagon, and square rod, tubing, angle, channel, moulding, strip, stock and bus bar.

Stops may be set and material guides mounted for production work in excess of 1000 operations per hour. The Bender is compact and portable, ideal for temporary or permanent work. There are no extra parts to purchase, as the DI-ACRO Bender has been built to cover a wide working range, with simple conversions. simple conversions.

Peacetime production for industry, forecasts the return of Wrigley's Spearmint Gum—that favorite "help on the job," for workers everywhere. But Wrigley's Spearmint will be back only when conditions permit its manufacture in quality and quantity to meet your needs. Until that day, we ask you to remember the famous Wrigley's Spearmint Wrapper shown at right, as your guarantee of the finest chewing gum that can be made.

You can get complete information from O'Neil-Irwin Manufacturing Co., Minneapolis 15, Minn.



Typical Shapes Formed by the DI-ACRO Bender



#### **OSP Selling Automotive** Parts on Huge Scale

Vice-

Stros

Ro

W Mgr. An Be Meta Octo Th

of n

Tire Adv

S. S

dept

SI

tion

Vice

P

Sale

G

ler,

S

the

ell,

tur

Geo

En chg Cor Ho

Lo

Co

Cr

Gr

tu

B

fo

Colly Mo Th

After one or two false starts which resulted in much adverse criticism and little in the way of success, the Office of Surplus Property of the Department of Commerce now is swinging into the merchandising of surplus automotive parts on a scale unequalled in history. The two principal differences from the previous method of sealed-bid sales at scattered auctions throughout the country are the adoption of fixed prices and the extension of credit to qualified purchasers.

Just how much surplus stock of new automotive parts the government now owns is anyone's guess. The most conservative estimates set it at about \$300 million, but others think that it may be closer to \$1 billion. Fabulous as this inventory sounds, however, the industry apparently is not greatly concerned about a market glut. One large manu-facturer is reported to have analyzed sales of automotive parts to the government and discovered that the total was something less than 25 per cent of his normal average annual output. About half of these parts are not common to commercial use, so that the net output of usable parts is estimated at about 10 per cent of his annual sales.

The merchandising plan set up by OSP works something like this: Eligible buyers are divided into four general classifications-parts distributors and wholesalers, new car dealers, general garages and repair shops, and fleet owners. Other fringe classifications, such as mail order houses and chain stores will be fitted into one of the four divisions, most likely the first. All known prospects will be advised of the program through direct mail brochures and classified advertising in newspapers and the trade press. They also will be apprised of eligibility standards which must be on file with the regional office serving their locality. These qualifications include proof of bona fide status as a going business organization under one of the four categories, and financial and credit information.

Approved buyers may then go to the (Turn to page 86, please)

#### **PERSONALS**

(Continued from page 52)

Vice-Pres. for Sales; Guy W. Allis, Vice-Pres. in charge of Richmond Plant; Joseph Stross, Vice-Pres. for Purchasing; and Harry M. Forman, Controller.
Roxalin Flexible Finishes, Inc., Robert

ROXALL FIGURE AND COLUMN AND COLU

Vice-Pres. and Gen. Mgr. Wheels, Inc., Major Edward D. Meeker, Mgr., Newark Branch.

e

which

m and

Office

tment

to the notive

story

m the

les at

coun-

s and

alified

f new

now

t con-

\$300 ay be

s this ustry

erned nanu-

lyzed

vernl was of his

About

on to

utput about

p by

Eligineral

and neral

fleet

tions, chain

four

All

f the

hures

apers

ill be

vhich

office

ifica-

tatus

ınder

ncial

o the

TRIES

Mgr., Newark Branch.
American Brake Shoe Co., Kellogg Div.,
william T. Kelly, Jr., elected Pres.
Bethlehem Steel Co., W. R. Shimer,
Metallurgical Engineer, has retired as of

October 1st.

The General Tire & Rubber Co., K. A. Dalsky, Mgr., Truck Tire Sales; J. E. Powers, Auto. Tire Sales; J. C. Ink, in ch. of newly organized sales operations dept.; E. C. Leach, Mgr. Kraft Recapping and Tire Accessories Sales; R. H. Harrington, Adv. and Sales Promotion Dept. Mgr.; and S. S. Berry, Battery and special item sales dept. mgr.

Speer Carbon Co. and affiliate, Interna-tional Graphite & Electrode Corp., Dr. Harry G. Mitchell, Adv. Mgr. The Arco Co., Major Paul L. Hexter,

Vice-Pres. and Director of Consumer Sales

Penna. Salt Mfg. Co., R. L. Cain. Asst. Sales Mgr.

Graham-Paige Motors Corp., H. C. McCaslin, Chief Engineer.

The B. F. Goodrich Co., Howard F. Miller, Mgr., Petroleum Co. Tire Sales Dept.; H. E. Heilman, Operations Mgr., B. F. Goodrich International Div.

Norton Co., Abrasive Div., F. W. Elya, District Mgr.

Square D Co., Walter H. Bodle, Asst. to the Merchandise Sales Mgr.

Casco Products Corp., Wallace R. Pow-

Casco Products Corp., Wallace R. Powell, Asst. Sales Mgr.
Ethyl Corp., Dan M. Guy, Mgr., Agricultural Div. of the Technical Service Dept.
Michigan Steel Tubes Products Co.,
George L. Miller, Vice-Pres. in charge of
Sales; F. W. Sexauer, Sales Mgr.; R. O.
Berg, Vice-Pres. in chg. of Research and
Engineering; J. C. Thrasher, Vice-Pres. in
chg. of Operations; Harry J. Longeway,
Comptroller and Office Mgr.; and E. C.
Hobart, Secretary-Treasurer.
National Highway Users Conference.

National Highway Users Conference, Louis E. Mesam, Public Information Direc-

#### Obituary

W. Chichester Sayle, president of The Cleveland Punch and Shear Works Co., Cleveland, and of The Cleveland Crane and Engineering Co., Willoughby, died suddenly, Sept. 15, at his home.

Edward S. Evans, 66, president of Evans Products Co., Detroit, died at his Grosse Pointe residence, Sept. 6, after a brief illness. He was stricken five days previous to his death on his return from a trip to the company's plants on the Pacific Coast, although his illness did not become immediately critical.

Karl Yost, 46, executive engineer for the Warner Electric Brake Manufacturing Co., died Sept. 18 at his home in Beloit, Wis. He had been in ill health for two months.





## Cuts FASTENING TIME 50%

#### Recessed Head H CHILLIPS TE Screws & Bolts



Faster, easier driving that results in stronger, tighter, burr-free fastenings at a saving in time up to 50%.

The engineered design of recess in HOLTITE-Phillips head screws permits application of full turning power. Taking heaviest driving pressures, screws are speedily set up tight and flush . . . without reaming or head breakage. Utilizing maximum driving power, screws can be turned in smaller pilat holes (more thread engagement) to permit use of fewer screws or smaller (lower

Power Driving cuts-Fastening Time in Half

As driver or bit mates exactly with recess in head of HOLTITE-Phillips screws, power drivers can be used safely even on finished parts. The bit cannot skid or jump from recess. Slow, hazardous, fatiguing hand-driving can be replaced by effortless power driving to cut fasten-ing time in half . . . to eliminate accidents and rejects . . . to strengthen assemblies.

Holding on end of driver or bit, these screws can be moved into position and driven with one hand — other hand free to hold or steady work.



#### CONTINER PHILLIPS SCREW LICENSEE GROUP



With large or small production, it will be to your advantage to make HOLTITE-Phillips the standard screw driving practice in your plant. Our Engineering Staff welcomes the opportunity to study your fastening problems.

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, III.
Chandler Products Corp., Cleveland, Ohlo
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mgc. Co., Chicago, III.
International Screw Co., Detroit, Mich.
The L. M., Harper Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, III.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw & Mfg. Co., Cleveland, Ohio
New England Screw & Mfg. Co., Cleveland, Chicago, III.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, III.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, III.
The Southington, Conn.
The Steel Company of Can., Ltd., Hamilton, Can.
Wolverine Bolt Co., Detroit, Mich.

#### From Bomber to Transport

Aircraft which have proved their worth in war are being converted by the British aircraft industry to peacetime pursuits, the latest to undergo such a change being the Short-Stirling.

This four-engined bomber is being converted into a passenger and freight transport. Loaded to 70,000 lb, it can carry a payload of 18 passengers and their baggage (equivalent to 3,960 lb), 1,300 lb of freight and 3,600 lb of mail (a total of 8,860 lb) a distance of 1,300 statute miles at a speed of approximately 207 mph, leaving a fuel reserve for a further 2½ hours' flying.

Passenger seats are arranged ninea-side on each of the lined and sound-proofed cabin. The cabin is lit by roof lighting and each passenger has a separate reading lamp. The windows take the form of curtained portholes, and a light luggage rack runs the length of the compartment on both sides.

Immediately aft of the passenger compartment is a wardrobe, and aft of that a galley with vacuum flasks and other kitchen equipment. Still further to the rear are two lavatories, each with a washbasin and mirror.

Power comes from four Bristol Hercules XVI air-cooled, sleeve-valve radial

engines, each of 1,600 hp, driving three-bladed, fully-feathering de Haviland propellers. When loaded to 60,000 lb, the new transport is said to be able to clear a 50 ft obstruction in 1,000 yards from the start of its take-off run, and with an all-up weight of 70,000 lb to climb at the rate of 650 ft a minute from sea level using maximum climb power and at 470 ft a minute on maximum weak-mixture cruising power. Its dimensions are: Span, 99 ft 1 in, length, 87 ft 3 in., height, 22 ft 9 in.

The addition of the Stirling brings

The addition of the Stirling brings the number of British four-engined air transports now available or under construction to 10. Some of these transports will be built in two separate forms, one for passengers, the other for

freight.

#### **OSP Sales**

(Continued from page 82)

OSP branch office and look over the parts catalogs for any items they want to buy and place an order. No cash deposit is required, and payments are on a 30-day basis. Shipment is made from the nearest parts depot stocking the needed item, with the freight charges borne by the government. The buyer pays the charge on receipt of the merchandise and then deducts it from the invoice, although he is required to attach the freight receipt as proof of payment. No orders for less than \$500 net after deduction of discount will be accepted. Smaller operators who cannot use that large an order will be serviced by their distributor.

Prices will be fixed at the standard list price for each item, less the customary discount prevailing in the trade for the particular category in which the buyer falls. It is important to note that the discount is averaged for all parts and does not follow the pattern of larger margins for slow-moving items and narrower limits for quickturnover parts. Also, an additional discount will be added to cover abnormal handling required to prepare parts which have been packaged for overseas shipment. Sparkplugs, for example, may be coated with protective materials which must be chipped off or dissolved by immersion.

As this is written, parts makers and automotive manufacturers are not ell-gible to purchase surplus automotive parts. It is understood that this is being protested bitterly, but there is no indication as to whether the ruling will be changed.

The switch from sealed bids to the direct selling method through regular trade channels at fixed prices is expected to thwart speculators who might obtain monopoly control of the supply of scarce parts. It also is expected to provide a maximum return to the government. The first of surplus parts offered for sale is said to include everything from "a cotter pin to an engine."



## Planning something . . . ? We can help you make it Better for Less

Competition will be intense in the days to come. Profits will depend upon Low Cost Production with the most efficient machines and methods.

Now is the time to scrap your old equipment and replace it with either War Surplus

Machines or new machines that can transmit the power and that have the
rigidity to use carbide cutting tools at their maximum efficiency.

For these cutting tools provide the fastest known method of metal turning today, increasing cutting speeds from 200 to 500 per cent.





hree.

iland 00 lb, ole to vards

and lb to inute climb

naxi-

. Its

in.,

rings

d air

arate r for

the want e on from the rges uyer merthe atpaynet ac. nnot riced dard cusrade hich note all tern ving ickdismal arts seas ple, ials lved

and elitive beno will the ular exight oply I to

OV-

of-

ry.

1e."

IES

#### JONES & LAMSON

MACHINE COMPANY Springfield, Vermont, U.S.A. Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

October 1, 1945

When writing to advertisers please mention Automotive and Aviation Industries

87

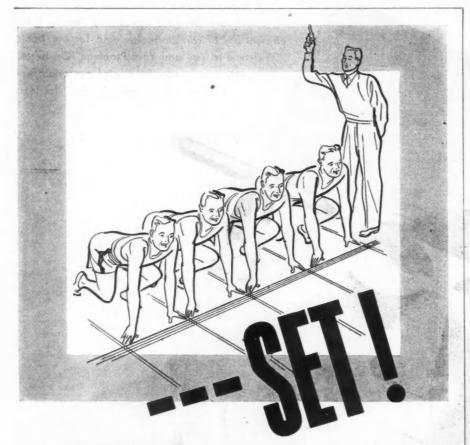
#### German Jet and Rocket Units

(Continued from page 21)

stage and three axial stages; an annular combustion chamber with turbulence "fingers" and 16 injection nozzles and an axial two-stage turbine, with hollow blades. An adjustable jet nozzle is fitted, having two positions, fully in for idling, and fully out for all other conditions. Data for this unit have been compiled as follows:

HISTORY — The Heinkel-Hirth turbo-jet unit program began in 1936, and up to 1944 there were three experimental units and six projected units. The He S 3 unit was installed in the He 178 aircraft and flew on Aug. 27, 1939. The He S 11 (later known as the He S 011) was begun in 1944, culminating in the series produced 011.

Static thrust	2,860 lb
Length nozzle extended).	3,510 mm
Max diameter	875 mm
Weight	2,090 lb + 2 per cent
Fuel	J-2 (light Diesel oil) in emer-
	gency K-1 (Diesel oil)



IT HAS SOUNDED—the first call for the peacetime sprint for industrial markets. And it's the last call for examining your product and plant to make sure that both are in

the pink of competitive condition.

Wouldn't it be wise to talk bearings with Aetna?—to investigate better, more effective applications for both plant and product.

Just the minute that Aetna's war production obligations are fulfilled, Aetna can start making bearings for your peacetime requirements—no reconversion lag.

As a smart first step—call Aetna.

AETNA BALL AND ROLLER BEARING CO. 4600 Schubert Avenue • Chicago, Illinois





#### Heinkel (Hirth He S 021 Turbo-Jet Unit (with Propeller)

A unit designated 021 was projected, and was to be a HE S 011 adapted for driving a propeller. The output at the propeller was intended to be 3300 hp at a speed of 560 mph.

#### Daimler-Benz Aktinegesellschaft Daimler-Benz 007 Turbo-Jet Unit

Prof. Leist started development of the 007 turbo-jet with Daimler-Benr and one unit was built and run in the autumn of 1943. Work on the project was then stopped by the German Air Ministry because the design was more complex than those of other firms.

The unit had several special features, the compressor and ducted fan being mounted on two contra-rotating drums. The inner drum carried nine-stages of compressor blading while the outer drum carried eight stages of compressor blading internally and three stages of fan blading externally. The turbine was cooled by partial admission over 30 per cent of its circumference of air drawn from the ducted fan circuit, the remaining 70 per cent receiving the working gases. Four tubular combustion chambers were used.

#### Walter HWK 509 Bi-Fuel Liquid Rocket Power Plant

This unit is employed in the Me 163 B which was the first operational aircraft in the world powered solely by rocket motor. The weight of the unit is only 365 lb and it develops a maximum thrust at sea level of 3300 lb. Its length is seven ft. Unlike the reciprocating engine and turbo-jet unit the liquid rocket motor gives increased rather than reduced power at altitude. Thus at 40,000 ft the thrust is about 10 per cent greater than at sea level. The unit can be throttled to give a minimum thrust of 220 lb. The fuels employed, known to the Germans as T-Sto and C-Stoff, give a specific impulse of 180 to 190 lb per lb-sec. In other words, a thrust of approximately 185 lb is obtained for a consumption of one lb of fuel per sec. For comparison with turbo-jet units it is more convenient to express the consumption in lb per hr per lb thrust and on this basis the figure for the 509 is 19 to 20 lb as compared with 1.3 to 1.5 lb for current German turbo-jet units.

T-Stoff is concentrated hydrogen peroxide and C-Stoff is a mixture of hydrazine hydrate and alcohol. In addition to its uses as a fuel C-Stoff is employed to cool the double-walled combustion chamber. The two fuels are contained in separate tanks and are delivered to the combustion chamber jets pressure from two turbine-driven pumps. At full thrust the rate of consumption is about 17.75 lb per sec, or more than 1000 lb per min.

(Turn to page 92, please)

## Leads in Performance ANDIS 1001 No. 12 CENTERLESS GRINDER

New, modern features make possible the superior finishes and high production you can obtain with the Landis Tool Centerless. These include:

★ Faster stock removal to close limits and fine finish by rigid support of work in guide that extends up to center line of regulating wheel spindle.

★ Simple rheostat controlled adjustable speed drive gives speed adjustment with no interruption of the grinding cycle.

★ Manual or hydraulic traverse of regulating wheel base for rapid, accurate wheel alignment.

★ Improved construction for tilting regulating wheel base for through feed grinding.

\* Swiveling regulating wheel base for grinding tapers.

★ Quick, easy setup of single work rest for parallel or tapered work.

★ Single, convenient valve at operator position controls coolant for grinding and dressing.



For complete information on the No. 12 Centerless Grinder, write for your copy of Catalog T44. Landis Tool Company, Waynesboro, Pa.



Here's a remarkable example of close tolerance grinding. This plunger for a fuel injector had to be held to hairline tolerances and perfect roundness to provide an exact pressure-tight fit. The rigid construction of the Landis Tool No. 12 Centerless Grinder made possible grinding to the extreme limits required, in only 5 to 6 passes and a finish of 4 to 5 micro inches.



Here's a striking example of high production grinding. These bearing bushings were ground on the Landis Tool No. 12 Centerless Grinder at the rate of 27,600 parts in 8 hours. Yet tolerances were held throughout the production run to ½ thousandth! Have you a grinding job that requires volume production plus superior finishes?

LANDIS TOOL
Company



urbo.

ected, d for at the 10 hp

aft Unit

Benz n the oject Air more

ures, being ums. es of

outer

com-

The

lmisnfer-

fan

t reular

uid

163

air-

by

unit

axi-

Its pro-

the

ude. bout

evel.

e a

as

im-

In

tely tion

ari-

conin

asis

as

ent

gen

of

adf is lled nels and amneate

IES

WAYNESBORO, PA.



Unlike other preformed clamps, the Central "360" provides unlimited elamping power . . . and remains a constant perfect circle with equal pressure over the entire 360° circumference of the hose . . . regardless of the amount of tightening pressure applied.

#### DEPENDABLE

Clamping power, even on synthetic hose, is unaffected by rough eastings or variations in hose diameter and resistance. The "360" tightens instantly. Its powerful pressure grip cannot be loosened by the most severe vibration.

#### **EFFICIENT**

No other preformed clamp equals the "360" for power, efficiency or speed of application. It is America's newest, most advanced wire hose clamp — guaranteed unconditionally for use on all water, oil, gasoline, air and high pressure connections.

Send Today for Free SAMPLE & BULLETIN No. 101

CENTRAL EQUIPMENT CO. 900 SO. WABASH AVE., CHICAGO 6. ILL

(Continued from page 88)

Only a fraction of the full thrust is required to maintain a fairly high speed in level flight. Under conditions of partial thrust, however, the efficiency of the rocket motor falls off rather rapidly. For this it has a main combustion chamber giving a maximum thrust of 3740 lb and a separate auxiliary chamber with a thrust of 660 lb. Both combustion chambers can be used together to give a total thrust of 4400 lb. For cruising only the small chamber is employed and enables a given thrust to be obtained for a lower fuel consumption than would be possible by throttling the larger unit.

#### **Postwar Plant Expansion**

(Continued from page 50)
miles east of Los Angeles in the Pomona Valley.

Plans are now complete to turn a large part of the heavy ordance manufacturing facilities of the Worthington Pump and Machinery Corporation's plant in Holyoke, Mass., into production of air conditioning and refrigeration equipment of the latest design. Facilities for the operation have ben moved there from the corporation's plant in Harrison.

Walker-Turner Company, Inc., Plainfield, N. J., broke ground on August 21 for an addition to Plant No. 2. The new construction will add 75,000 square feet to the floor space of this plant and will cost \$300,000.00. Plans are completed, also, for increasing the area of Plant No. 1—also in Plainfield. The total area of the new construction for the two plants will be 200,000 sq ft.

The Monroe Auto Equipment Co. has announced the purchase of a large new plant in Hillsdale, Mich., and expansion of the company's main factory and another recently acquired plant in Monroe.

These three steps in the company's peacetime program will increase manufacturing facilities to a total of 454,000 sq ft or more than 10 acres—three times the floor space utilized in 1940, just before the war, and ten times the space used in 1937. The entire expansion program involves an expenditure of approximately \$1,500,000 for plants and equipment.

Evans Products Co. has purchased the government owned munitions plant at Plymouth, Mich., operated by Kelsey-Hayes Wheel Co. during the war. Purchase price is reported to be \$1,450,000. Edward S. Evans, executive vice president of the company, states that the plant will be used for production of automobile loaders, trailers, and other types of automotive equipment. Much of the work which previously has been farmed out to subcontractors will be done at the new plant, which is expected to be in operation in about six months.



### **Dependable Water Supply**For America's Railroads

Water is of tremendous importance to railroads! A shortage—or failure of water supply can play havoc with schedules. Maintenance engineers on practically all of America's major railroads have long insisted on—and use Layne Well Water Systems. These experienced men can—and do place absolute confidence in Wells and Pumps built by Layne. No other kind has yet won their full approval.

The reason of such broad and overall preference is almost too obvious to mention. In advanced engineering design alone, Layne Well Water Systems are far ahead of competitive makes. But it is the genuine rugged quality and long trouble free life of Layne water producing equipment that wins and holds the grateful thanks of all owners. Layne Well Water Systems are serving

Layne Well Water Systems are serving all types of industry—thousands of cities, irrigation projects and the world's largest mines—not only the United States, but in practically every foreign country on the clobe.

Right now, Layne is back on full time service for civilian needs. If you need a modern and highly efficient water system, write or wire for further facts. For literature, address, Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

#### HIGHEST EFFICIENCY

de

th

lo

Layne Vertical Turbine Pumps are now available in sizes to produce from 40 to 16,000 gallons of water per minute. Their high efficiency saves hundreds of dollars on power cost per year.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. \* Layne-Atlantic Co., Norfolk, Va. \* Layne-Central Co., Memphis, Tenn. \* Layne-Northern Co., Mishawaka, Ind. \* Layne-Louisiana Co., Lake Charles, La. \* Louisiana Well Co., Monroe, La. \* Layne-New York Co., Mishawaka, Ind. \* Layne-Northwest Co. Mishawaka, Layne-Northwest Co. Mishawaka, Layne-New Hork Co., Mishawaka, Layne-Northwest Co. Mishawaka, Layne-Houston, Columbus Survey, Co., Sansas Co., Layne-Northwest Co., Sansas Co., Layne-Northwest Co., Sansas Co., Layne-Northwest Co., Layne-Mishawaka, Layne-Hispano Americana, S. A., Mexico, D. F.



WELL WATER SYSTEMS VERTICAL TURBINE PUMPS



#### that haunts a machine tool designer's life

The "thing" is not a ghost or a nightmare. It's real as life. It's the vicious chatter, the destructive vibration that kills the very quality of work for which the machine is designed. Not right away but after the machine is in the customer's plant. The villains that perpetrate the "thing" are, of course, bearings that can't take the load and hold their accuracy.

That's the sort of situation that calls for Fafnir and that Fafnir responds to with a specific designing job, such as the "MM Series" of ball bearings. Out of the extreme demands of machine tool

designers for utmost rigidity, load capacity and long life, came new refinements in ball bearing design. The demand load of the machine tool and the work limits can be perfectly matched with precisely determined pre-loads. And the use of specially heat-treated steels and ultra-precision grinding of raceways provides far greater rigidity and consequent accuracy over a far longer life expectancy. Operating limits have been raised for this MM Series as high as 50,000 r.p.m. in actual service and have operated at these speeds for as much as 8,000 hours.

That's the kind of cooperative design engineering which Fasnir has practiced in industry after industry. It's the reason for "the most complete line of ball bearings in America"... and for the ball bearing engineering staff at home and in the field devoted to more and more of the same design cooperation. It's the best possible reason for saving time by putting a bearing problem up to Fasnir first. The Fasnir Bearing Company, New Britain, Connecticut.



BALL BEARINGS

Most Complete Line in America



ime d a

#### Labor's Wrench in Reconversion

(Continued from page 17)

situation. The shadow boxing and political maneuvering within the union itself indicates an explosive internal situation that may be touched off any time. In view of what has happened innumerable times during the war and since V-J Day, the unions have yet to demonstrate that they can keep their locals in line.

Without trying to over-simplify the issue of the 30 per cent wage increase, it appears that there is one basic point of dispute to be settled. The union contention as put forward by Walter Ruether, union vice-president and director of the G. M. division, is that the increase can be granted without increasing the price of the product. He points to the profits the corporation has made during the war and says the volume of production in the postwar period will enable payment of the demanded increase. In other words, he implies that there is just too much profit in

the automotive industry as it open in pre-war years and that the m must be revised to give labor a la share. That is the real nub of

question.

The possibility of any settle through discussion now appear tremely remote, at least in the Ger Motors case, since C. E. Wilson, dent, on October 3 flatly rejected union's demands as unreasonable. first indication of any major au tive company's attitude on the mass the letter which Wilson sen Ruether and which vigorously assi the 30 per cent demand as unre able. Mr. Wilson pointed out that 40-hour basic work week with time for excess hours is still in eff General Motors plants will operate m than 40 hours per week in plants wh customer requirements and availa material make this possible. Work reconversion, construction and m ernization now are on 48 hours, as its Electromotive plant af LaGran Ill., although now closed by strike. the demands were granted General l tors would have to pay more than hours pay for 48 hours work for over time employes.

#### War Profits Not Excessive

He branded union claims that Ge eral Motors made excessive war profi as not true, pointing out that average profits for var years were under thos of average prowar net despite double sales and en loyment. General Motors, he said sannot and will not us money saves up for many years to modernizing and expanding plants to pay excess ages for work not per formed. Notice will excess wages b currently and from presumed futur excess profits when a realistic forecas of costs shows there will be no such excess profits. Nor can General Mo tors pay from current income the increased wages demanded when the present OPA policy holds prices at substantially 1942 levels, he said, especially in view of the fact that there have been important increases in wages and operating rates since 1942. Furthermore, there is no provision in the present OPA pricing formula for increasing prices to compensate for the additional cost that would be incurred at this time.

Mr. Wilson charged that the union is responsible for trying to start an inflationary spiral of increasing wages, costs and prices. It could result only in correspondingly increased cost to consumers with a resulting constriction of the market and fewer jobs, he added. The letter also touched on the general obstruction to reconversion by unauthorized strikes, and the need for working out a sound and equitable solution that will put more persons to work. He concluded with the statement that, "For all of the above reasons, we reject your unreasonable demands."

Going along with the demand for inincreased pay is the demand for col-(Turn to page 96, please)



## are not over!

## THE VICTORY

There's plenty of action ahead for fast-thinking industrial leaders in the new Victory Loan! Your Victory drive is important

EVERY VICTORY BOND HELPS to Bring our boys -and give the best medical care to our wounded

THE NEW F. D. ROOSEVELT MEMORIAL \$200 BOND

Urge employees to buy the new Franklin Delano Roosevelt Memorial Bond through your Payroll Savings Plan! Better than ready cash, Victory Bonds are industry's "Thanks" to our returning heroes!



#### START YOUR VICTORY DRIVE TODAY!

Every Victory Bond aids in assuring peacetime prosperity for our veterans, our nation. your employees - and your own industry!

The Treasury Department acknowledges with appreciation the publication of this message

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council



October 1, 1945

8

IES

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

lective bargaining on an industry-wide basis. Here the industry is more vocal. Its stand was made clear by George Romney, General Manager of the Automobile Manufacturers Association, when he presented the industry's views to the Mead Committee hearings in Detroit last March, as managing director of the Automotive Council for War Production. From all indications the stand presented then still represents the thinking of the industry. In brief, it holds that industry-wide collective bargaining on wages is but the first step in cartelization of the industry. The next step after wages would be agreements between management and

labor on fixing prices and production, and when done on an industry-wide basis this would destroy the traditional competitive structure which has enabled the industry to pay the highest wages of any, while at the same time producing better automobiles at lower cost.

"Automotive companies," Romney said in New York recently, "are opposed to cartelization on any basis and are for a competitive economic system based on individual responsibility and voluntary cooperation under economic policies fixed by Government. Union-management cooperation must come quickly, but not at the sacrifice of these fundamentals upon which our past is based and our future depends,"

Whether or not there will be major strikes against any or all of the large automobile manufacturers this Fall is unpredictable. However, many strikes have been called against suppliers, and if continued may have the same effect as a shutdown of the assembly plants At the time Ford shut down indefinitely on September 14th, sixteen suppliers strike-bound. Issues involved were ranged from veterans' seniority to paid lunch periods, and in only one case was the 30 per cent pay increase a factor. However, it is certain that pay increases by manufacturers will be followed by like demands on suppliers. Among other potential trouble breeders are foremen's unions. Hudson Motor Car Co. has been closed since the first of September when the Foremen's Association of America struck, necessitating the layoff of more than 6000 persons. Packard Motor Car Co., where the FAA won an election last Spring, is contesting in the courts the right of foremen to bargain collectively on the contention that they are a part of management.

#### Car Prices Depend on Wages

So far, none of the automotive firms has announced its prices for 1946 models, and it now is fairly certain that none will do so until labor costs have been determined. Under the formula set forth by OPA, voluntary wage increases may not be computed as increased costs over 1941. Unless this section is changed, it is felt in Detroit, any sizeable wage increase will have to come through some form of government arbitration in order that it may be included in ceiling price estimates.

The role of Government in labor arbitration cannot be overlooked for this reason. However, there is little optimism over the recent reshuffling of labor agencies by President Truman, which resulted in placing WLB, USES and WMC under Secretary of Labor Schwellenbach. In the first two weeks after the Labor Department entered the picture in Detroit with its conciliators, the situation grew steadily worse and prospects for improvement are dim.

THIS

RESIS

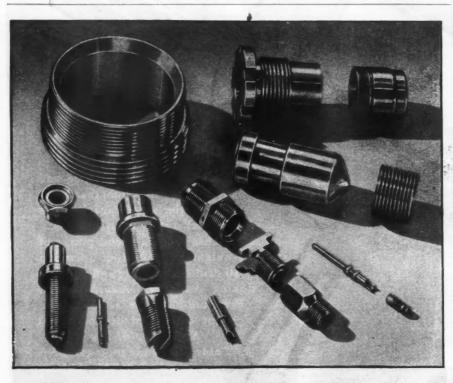
SEAN

Octo

Management's view of the whole situation is summed up by Frank Rising, General Manager of Automotive and Aviation Parts Manufacturers Association, who states:

"Today, most management in reconverting industry faces a year of uncertainty. As we've said before, there has been a general expectation up to now that wage rates would be advanced on the whole, about 10 per cent or so, as volume and productivity increased.

"There have been a few announcements of increases ranging from 10 to 15 per cent. Management wants to get going, to hit the ball. It asks only two things of the unions-productivity and a sense of responsibility. In return, management expects to pay the highest wage rates in our history and in the world."



## Symphony In Brass

It will be sweet music to your ears to know your peacetime requirements of Precision Brass Screw Machine Products can be fully met by The Chicago Screw Company.

If you manufacture any one of the thousands of new peacetime products using Brass Screw Machine Parts you will find us a dependable source of supply. Any quantity—Any Shape -Any Size to 5" diameter including such finishing operations as Milling, Broaching, Grinding, Thread Rolling, etc., can be furnished exactly to your specifications.



We have the "Know-How", proper facilities and a sincere desire to serve you.



#### THE CHICAGO SCREW GO.

1026 SO. HOMAN AVENUE

CHICAGO 24, ILL.

# HIS KIND OF

ajor

rikes and

fect

ants.

itely

liers olved paid was ctor.

in-

iers.

ders otor first

As-

tat-

ing,

t of

of

rms

that

AVE

in-

this oit,

ave ernnay tes.

rbi-

his pti-

of

an,

ES

hor

the

TS

and

ole

ng,

ind

ia

on-

er-

185

OW

on as

ce

10

get

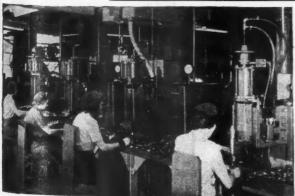
wo

h-

ES







THESE FEDERAL RESISTANCE WELDERS

All standard models, attain high production in assembling small parts components.

**INSTALLED BECAUSE THEY CUT COSTS** 

220 DANA ST., WARREN, O.



# VERSATILE MODERN PRODUCTION TOOLS

#### **NEW HYDRAULIC WELDERS**

Two new models of spot and projection welders, hydraulically operated, are described for the first time in detail in Bulletin 4520 issued by The Federal Machine and Welder Company. One type, available in three sizes with 30, 50, or 75 KVA transformers, employs an inverted hydraulic cylinder in which the piston rod is the fixed member mounted on a unique adjustable connection which provides for close timing and quick follow up. A larger model, available in two sizes of 100 and 150 KVA also is described. Complete specifications are listed.

#### **HOUSEWARE PRODUCTION**

Anticipated expansion of houseware production points up the advantages of Federal resistance welding for the fast, low cost application of handles to enameling steel or aluminum pots and pans. Press type welders are used, with dies that permit rapid loading, give production of 500 to 800 handles per hour, depending upon type of handle applied. Cost with one manufacturer is one-fifth previous method.

#### **HOW TO MAKE PROJECTIONS**

Interesting and useful information on machines and methods for projection resistance welding is included in a new sixteen page booklet just released by The Federal Machine and Welder Company. There are descriptions of various types of projections, tables of proper measurements for projections and complete data on twenty varieties of welders adaptable for either projection of spot welding.

Several interesting special applications are illustrated. These include an eight-station dial-feed fixture for automatic welding of radar tube assemblies at high speed; a dual head for series projection welding; a special fixture for welding aircraft heat exchangers; several air clamping fixtures for quick loading and unloading of work in welding dies; a machine that automatically welds nails to trim moulding.

Special equipment such as rubber heads, air-lock heads and anti-friction slides also are shown. The book is available on request . . . Bulletin 4520.

#### FOR CONTAINER MAKERS

A special book of particular interest to container manufacturers is in the list of literature available on request at The Federal Machine and Welder Company. Principal theme is description of a complete steel barrel welding plant. Several special machines for resistance welding a variety of metal containers are illustrated. Bulletin SP 245.



By momentarily storing the force of a blow and "slowing the punch," the coiled and compressed rawhide in C/R Hammers and Mallets (1st) takes the shattering crash out of powerful blows . . . prevents breaking, disfiguring or marring of products, machines and fine finishes. (2nd) eliminates recoil-ends the fatiguing bounce common to most mallets.

With a C/R Hammer you can use a lighter tool, still strike harder and more effectively; can accomplish more with less fatigue; because striking force is mono-directional with more carry through.

WRITE FOR CATALOG SHEETS CHICAGO Kawhide 1310 ELSTON AVE \* CHICAGO 22 ILLINOIS

#### 1946 Hudson

(Continued from page 23)

the front. All models carry series identification on the hood below the molding. Wide, full-length running boards are continued for 1946, concealed by the flare at the bottom of the doors. Another safety feature, the front-hinged hood which locks from the driver's compartment, is continued for the coming year, with the battery conveniently mounted under the hood.

Interiors have been completely restyled in all 1946 Hudsons. Upholstery fabrics are of neutral tone-a fine shadow weave in the Super series and Bedford cord in Commodores. Airfcam seat cushions are standard in Commodore models and an extra-cost option in the Super series.

Leather is generously used in the upholstery plan of all 1946 Hudsons, particularly in the Commodore Series, in which not only arm rests, seat backs and door panels are leather trimmed, but seat cradles are leather covered and seat cushions are edged with broad bands of grained leather.

Instrument panels on all models have a wood grain finish with instruments against a silver background in the Super Series and a gold background in the Commodore Series. Commodore models have a steering wheel of plastic, 18 in. in diameter; in the Super series the wheel is of 17-in. diameter, grained to match the instrument panel. Hardware, both exterior and interior, is of new streamlined design.

Six and eight-cylinder engines are cuipped with dual carburetion.

The 1946 Hudson, regardless of body style, will be offered in a range of nine standard body colors, with two special cost colors and three two-tone combinations at extra cost.

In addition to its Super and Commodore series of passenger cars, Hudson will put into early production a 34-ton cab pick-up sharing the major features of the regular Hudson line, including independent coil spring suspension at the front and leaf springs at the rear designed for commercial loadings. It will be powered by the Super-Six 102-hp engine. The brakes are 11 by 134 in., the same as on the Commodore chassis, and tires are 6.50-16-6 ply. This model will be offered in a choice of three body colors.

#### Scoville Resigns to Start Own Business

John W. Scoville, chief statistician for Chrysler Corporation, has resigned to start his own business as a consulting economist and to write on economic topics. He joined the old Maxwell organization in 1921 as statistician and became chief statistician for Chrysler in 1925, when the corporation was founded.



The

ature

Kri

cous.

ing a

be ca

hard,

or ot

durin

durin

lower

teria

dex o

ontic

into :

wide trans

Trai

And

T

in

gy er be ti

an th

C

Oc.

Kr

#### 

(Continued from page 46)

proved pipe wrench; the "Fulc-o-matic," an automatic "plierench"; "Grip-o," a companion to the "Rockerench"; and "Over-Grip," an adjustable nut wrench.

## Plastic with High Optical And Electrical Properties

RE

ON

ON

ING

G

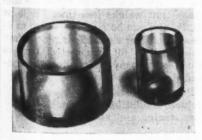
A non-flammable thermoset plastic with high optical and electrical properties, good resistance to abrasion and high resistance to oils and greases and most chemicals, including acids and alkalies, is a recent development of the F.F. Goodrich Chemical Co., Cleveland, Ohio. The new material has been named Kriston. This is the first of the new postwar products to be announced by the company.

The product, one of a series of new thermosetting resins, is formed by polymerizing liquid monomer in the presence of a suitable catalyst. Low temperatures and no pressure are required.

Kriston monomer is a somewhat viscous, water-clear, anhydrous liquid having a specific gravity of 1.25 which can be cast in simple molds. It sets to a hard, heat resistant plastic. No water or other volatile products are released during the polymerization. Shrinkage during polymerization is substantially lower than that of any other known material of the type.

Kriston polymer has a refractive index of 1.57. This is higher than most optical glass. The material can be made into a water-clear plastic or made in a wide range of colors which can be transparent, translucent or opaque.

### Transparent Dust Caps And Thread Protectors



The round plastic caps illustrated were engineered by Standard Molding Corp., Dayton, Ohio, for use as protective coverings for the bearings in bomb sights and in gyroscopes during the assembly operation. Fitting snugly over the ball bearings, these transparent protective caps keep all dirt, dust, lint and particles of foreign matter off the bearing surfaces. They are removed only at the final assembly station, when their important job of protecting the bearings is done. Such injection-molded transparent coverings, giving visibility as well as protection of costly bearings, lend themselves to many similar uses in the manufacture and assembly of precision equipment in peacetime.

#### Air Operated Valve

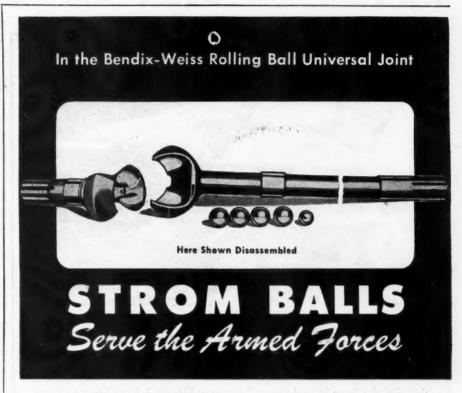
Hills-McCanna Co., Chicago, Ill., now offers the advantages of air operation of its valves in sizes ranging from 4 in. through 12 in. Westinghouse Flexair and/or Controlair controls, together with an air-actuated piston, actuate the valves.

Flexair control alone provides simple open and shut operation. Flexair and Controlair offer opposed air operation so as to provide smooth throttling over a range wide enough to permit easy instrumentation. An auxiliary air tank is part of the design to provide shutoff in the event of failure of the main air supply.

#### Improved Flare Nut Wrench

A new flare nut wrench, for use on plastic pipe, tubing and soft metal fittings is being introduced by the Plomb Tool Co., Los Angeles, Cal. The head is flat, based on a modified 12-point design, with opening which allows access to fittings around tubing. These features, coupled with deep, thin walls,

(Turn to page 104, please)



Here, in the Bendix-Weiss Constant Velocity Universal Joint, Strom Balls do their part in making military vehicles, from Jeeps to 14-ton Armored Cars, the efficient fighting equipment that they are. This is only one spot in our great war production effort where the high degree of perfection of Strom Balls serves industry, enabling it to provide the finest bearing equipment towards its great contribution to total victory. Strom Steel Ball Company, 1850 South 54th Avenue, Cicero 50, III.

Largest Independent and Exclusive Metal Ball Manufacturer



IES



Plomb flare nut wrench

permit use in close places and small turning arcs. Possibility of damage to the fitting is remote because the wrench has better contact with the nut and cannot slip and chew it.

The primary uses of the flare nut wrench are in the assembly and maintenance of all types of lines, including fluid, air, gas, etc.

#### **Universal Testing Machine**

A machine for making tensile, transverse and compression tests up to 60,000 lb is the latest product of Steel City Testing Laboratory, Detroit, Mich. The upper and lower pulling heads of this Model MP-10 hydraulic machine are of the conventional type with wedge jaws for both flat and round specimens. Holders are available for shoulder and thread end specimens. A suitable load regulating valve is provided which will maintain a uniform load rating. Any load can be held for any period at the will of the operator. The gages have maximum pointers and are fully protected against overload. A maximum



Model MP-10 testing machine

stroke of six in. is provided in the cylinder. The traverse table has a maximum span of 30 in.

#### **Molded Silastic Parts**

Silastic parts—gaskets, seals, hose, rubber to metal adhesion and miscellaneous pieces—are now available commercially. Production of these molded parts was undertaken by the Connecticut Hard Rubber Co., New Haven, Conn., in cooperation with the Dow Corning Corp., which developed this high temperature elastic material from sand.

Its s

The

ma

mo

gre

gre

An

slic

Wi

slie

ap

rat

tro

ati

an

ab

G

12

Extreme heat resistance is the outstanding physical characteristic of Silastic, trade name for new Dow Coming silicone rubber. It is said to withstand temperatures from — 70 F to 500 F and still retain its original resilience and flexibility.

#### Lightweight Plastic Foam

United States Rubber Co. is producing a buoyant material, known as flotofoam, that weighs less than 1½ lb per cu. ft. and can be made to weigh as little as ¾ lb per cu ft. This plastic foam was used to fill large steel pontoons which kept Army tanks afloat when unloaded a mile or more from shore.

Peacetime uses for this new material include insulation for homes, automobiles, trains and airplanes.

#### **Heaviest Passenger Load**

Pan American World Airways set a record for the heaviest passenger load ever carried out of La Guardia Field when the American Clipper took off for Bermuda recently with 64 passengers and a crew of 13.

The American, under the command of Capt. Hamilton Smith, also carried 154 pounds of mail and 193 pounds of Clipper Express.

This record surpassed by nine the mark set by the Atlantic Clipper August 3 when it took off from La Guardia for Foynes, Eire, with 56 passengers, plus 12 crew.



# FWD and TUTHILL Teamwork Where the Going is Tough!

WHEN the Four-Wheel Drive Co. chose TUTHILL Leaf Springs, they had in mind the rough-and-ready service to which their trucks would be subjected. They wanted Springs equally tough, strong, serviceable—to match their trucks.

Tested, heat-treated, inspected and shot-blasted, TUTHILL withstands service on the roughest, toughest jobs. Used by F. W. D. and many other manufacturers of trucks, tractors, etc., TUTHILL proves its built-in Quality.

Submit your Springs Problems to Tuthill Engineers

TUTHILL SPRING 763 W. POLK STREET CHICAGO 7, ILL.



Quality Leaf Springs for Sixty Years

# HERE'S WHY WE CALL IT 7he SIMPLIMATIC

e cylmaxi-

hose, niscelcomnolded

necti-

laven,

this

from

out-

c of Corn-

with-

F to

oduc-

flotob per s lit-

foam

toons

n un-

erial

omo-

et a load lield

for

gers

and

ried s of

the

Au-

uarsen-

RIES

Its simplicity starts with this first basic idea: The use of this large horizontal table which makes it possible to place every tool in its most favorable working position. Here, a greater number of slides can be used. A greater variety of positions is possible. Angle feeds are no problem. Compound slides are unnecessary.

Tool set-up is simpler and more effective. With each slide individually cammed, all slides are independent of each other as to approach, order of engagement with work, rate of feed, dwell, and retract.

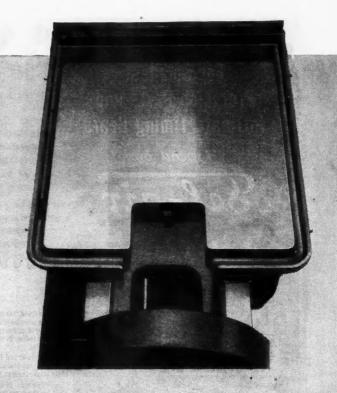
Only one simple lever is required to control the complete cycle of machining operations. It doesn't take skill to keep this automatic lathe turning out work swiftly and within the limits.

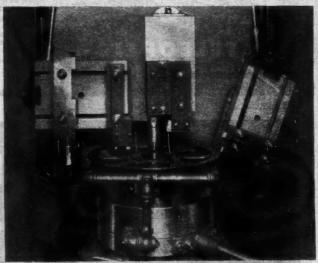
"SIMPLIMATIC" really describes this simple automatic lathe. If you have parts in volumes to justify its use, get all the facts about it. Write for literature.

GISHOLT MACHINE COMPANY
1205 East Washington Ave. • Madison 3, Wis.

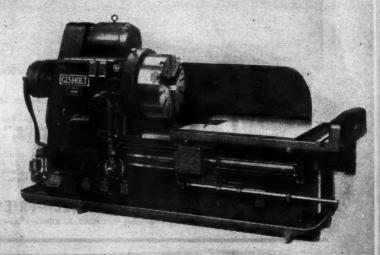


Look Ahead ...
Keep Ahead ...
With Gisholt
Improvements in
Metal Turning





With this typical Simplimatic tool set-up, turning and shaving the tapered outside diameter, boring, facing, grooving and chamfering are done simultaneously, in one operation. Tools are quickly and easily adjusted for a variety of sizes.



TURRET LATHES . AUTOMATIC LATHES . BALANCING MACHINES . SPECIAL MACHINES





load—faster and safer with no danger dropped loads. Stack sheet stock—lo or bundled—higher, evener, closer or but

Features insure maximum protection for both men and materials. Long carrying angles prevent damage to edges. Surface scratching of high grade stock is pre-

One-man end operation or remote cab control keeps workmen away from danger point, plus eliminating need for extra alsle space. Cuts labor cost—no sling

Sliding lock bar (optional equipment) quickly adjusts legs to accommodate different widths. Tong action compensates

for sug. C-F Litters are available in capacities from 2 to 60 tons or larger, in standard or semi-special designs to meet your specific requirements. Write for bulletin SL-21.

#### CULLEN-FRIESTEDT CO.

1309 S. Kilbourn Ave., Chicago 23, III.

LATHES . AUTOMOTIC LATHES . EALAHDING MACHINES . SPECIAL MACHINES

#### Superchargers

(Continued from page 39)

by a supercharger where its function is essentially that of a blower for scavenging. Some diverse opinion also exists as to the most effective application of the supercharger, the contention being that it can do more on a Diesel than on a gasoline engine.

Let us consider a few of these opinions more in detail. Hans Bohuslay, vice president in charge of engineering of the Sterling Engine Co., well known as a Diesel engine specialist, believes that most passenger car engines and many truck engines have more potential peak power available than they can digest for some time to come. On the other hand, he believes that the Diesel engine can utilize only a fair percentage of the air drawn into the cylinder, possibly 75 to 80 per cent at the best, and considerably less in engines having lower combustion efficiency. Therefore, he is convinced that the supercharging of Diesel engines offers the most attractive possibilities.

FO

B-W Superchargers, Inc., builders of positive displacement Roots type blowers for gasoline and Diesel engines, draws attention to the almost spectacular trend to two-stroke cycle Diesel engines in recent years, pointing to the imperative need for stepping up performance of four-stroke cycle Diesel engines by increasing mean effective pressure through supercharging and by higher piston speed. According to Wa-sielewski, B-W chief engineer, supercharging has boosted the power rating of small four-stroke, naturally aspirated engines from 30 to 50 per cent. In one case in particular, that of a 1000-hp, four stroke cycle engine, output was raised to 1960 hp by a combination of supercharging and increased speed. Such experiences have demonstrated the potentiality of increasing prewar ratings by 75 to 100 per cent.

So far as B-W can judge the situation, the most promising field for supercharging gasoline engines is the heavy duty "work horse" class of engines rated 150 hp and upwards. Such applications would go hand-in-hand with the availability of higher octane fuels. While supercharging pressures for such engines will be lower, in general, than for Diesel engines, the efficiency of supercharging will be more important. The following kinds of operations are listed as market possibilities: Diesel and gasoline engines for trucks and buses, Diesel powered locomotives, construction and heavy farm machinery, engine generator sets and power plants, marine engines for pleasure and commercial use.

Schwitzer-Cummins Co., has supplied thousands of centrifugal type superchargers for gasoline engines in past years and claim an increase in engine output from 30 to 40 per cent with a boost in manifold pressure to 20 lb. abs. This company also claims credit as a

(Turn to page 110, please)



nction

for

also plica-

ntion Diesel opinislav, ering

nown

and otenthey

On

the fair the

t at

effithat

ines

ties. s of

ow-

nes, acu-

en-

the per-

entive

by

Va-

ing

pint.

8

out

ed.

the at-

ıaer-

vy

es

ith ls.

or

al,

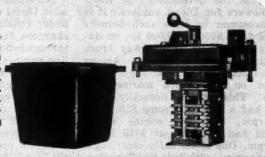
ıt.

reseled

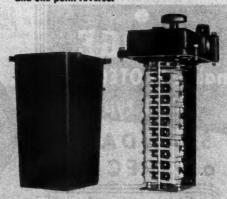
st ne a s.

S

Small sixe—general purpose. Our small-sixe switch is cam-operated and spring-return to the off position. This particular device is recommended for single-speed reversing service or for two-speed non-reversing service.



Small size—dust-tight and watertight. The small size, too, comes in a variety of enclosures to meet different operating conditions. An example is this three-pole, reversing, rotating-cam switch in a watertight and dust-tight cast-iron case. It provides one point forward and one point reverse.



Multispeed—dust-tight and watertight. Rotating-cam switches come in enclosures to meet your needs. Here is a reversing, multispeed, rotating-cam switch in a watertight and dust-tight cast-tron case. This switch provides four speeds forward and one speed reverse.



Multipose general purpose. This generalpurpose type of relating-cam switch is available for single-, two-, three-, or fourspeed motors requiring forward and/or reversing service. Particular care has been taken to assure you of obtaining the longlived service that you want in a switch.

#### FOR EVERY MACHINE APPLICATION

When you need motor starters, be sure to investigate G.E.'s complete line—perhaps some may give you important savings in time, space, or materials.

Take combination starters, for example—because you buy one packaged unit, less time is required for ordering and for installation. You can save space, too, by mounting them in small, unused spaces either near to or remote from the operator. And critical materials are conserved because these starters have less copper wire, steel conduit, and fittings than separately mounted devices.

Also shown here are other G-E starters—leaders in their field. They range from a general-purpose type of rotating cam switch to a full-voltage, multispeed magnetic starter. Frequent starting, remote control, different starting speeds, and many other special requirements can be obtained by selecting one of these starters.

And all G-E starters come in a variety of enclosures designed to meet different operating conditions.

We'd like to send you any additional information you may want. And remember, our engineers will be glad to assist you in selecting exactly the right starter for your needs. Get in touch with your local G-E office today. Or if you prefer, write directly to General Electric Company, Schenectady 5, N. Y.



Buy all the BONDS you can - and keep all you buy

pioneer in the development of Roots type blowers for Diesel engines. It is not uncommon to have such blowers operate from 8000 to 10,000 hr. on stationary engines or in highway truck operation without overhaul. Among these installations was the supercharger on a Packard marine type engine. This engine, normally aspirated, had a rating of some 820 hp at 2400 rpm; the same engine supercharged had a rating of 1710 hp at 2400 rpm. One of the early centrifugal superchargers supplied by Schwiter-Cummins was for the Lycoming straight-eight engines used in certain of the Auburn models in 1935 and

Schwitzer - Cummins believes that most Diesel engine manufacturers have under consideration the use of superchargers for postwar models to meet the competition of higher output gasoline engines when better fuels become available. This appears to be in the cards judging by some preliminary work with engines on a break-down run operating continuously at 175 bmeb without ill effect upon standard bearings, valves, and other accessories. Manifold pressures, now around 4.0 to 8.0 lb, can be boosted to 12 to 15 lb because good performance gains can be achieved at these levels without intercooling.

In an SAE paper entitled, "Possibili-

ties of Gasoline Engine Development," by F. S. Baster, comment is made on the use of supercharged gasoline engines for motor truck and bus service According to the author, "It is general. ly accepted that the roughness of an engine, with compression ratio increased to take full advantage of high octane fuel, will be sharper and more objectionable than that of an engine which uses supercharging with a lower compression ratio to take full advan-tage of the same fuel." He shows further that the octane requirement for a typical normally aspirated engine falls off with an increase in speed, commenting that better advantage can be taken of available fuels by providing a little boost at the lower speeds and gradually increasing the boost as the speed increases. This would tend to give an engine octane requirement characteristic more closely approximating a constant octane requirement. This type of boost would tend to increase output without materially increasing the peak torque so that the capacity of the drive train from the clutch through the transmission and rear axle would not have to be increased materially.

Baster stresses the point that many improvements will have to be made to provide for greater durability and ruggedness owing to the increased temperatures to which the engine parts will be subjected. Among these are the use of sodium-cooled valves for the exhaust and possibly intake, possibly oil cooling of pistons, more adequate cooling of valve seats and combustion chamber parts. Finally the author concludes that supercharging may be limited to those operations and territories which require large powerplant

units.

Generally speaking there is some agreement that supercharging may be more justified for Diesel engines of four-stroke cycle type, and for gasoline engines of fairly large output for large vehicles, for farm machinery, and for stationary power plants of all kinds. It may be noted at this point that supercharging has unquestioned merit for all heavy duty operations in high altitudes whether for stationary power or for road vehicles.

#### The Turbocharger

In the judgment of many engineers contacted by the writer, the exhaust driven Turbocharger offers the most promising field for further development for most automotive applications, including passenger cars. As we mentioned earlier, the turbocharger has demonstrated remarkable performance on military aircraft for high altitude operation. Future work in the automotive field needs must be centered about a simple and relatively inexpensive mechanism which can be justified on a cold economic basis.

According to B-W, in Europe the turbocharger has been used on Diesel engines as small as 165 hp. This type should have attractive features for

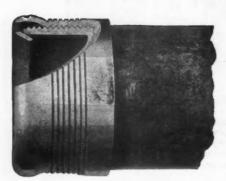
(Turn to page 112, please)





We specialize in Protectors of all types and have many standard size Closing Plugs, Pipe Protectors, Plain Ends and Thread Protectors available. Will make up special to meet your requirements. It pays to protect valuable parts. Write.





Patent No. 2,156,169

There is the best and most efficient way of doing any operation. Many have found that using WEDGE Chill Rings with the patented SPLIT Feature is the BEST way of welding pipe or tube joints. Write.

#### WEDGE PROTECTORS, INC.

9540 RICHMOND AVENUE

**CLEVELAND 5, OHIO** 

*Wse* WEDGE Chill Rings-Thread Protectors €

# Pea-Size to Cartwheels

Whether you're looking for a grinding wheel the size of a small pea...or even smaller... or a 42" crankshaft wheel...you can find it in the Bay State line.

ment," ade on ne en ervice. neral. of an

o in.
f high

more engine

lower

dvans fur.

for a

falls

menttaken

little dually

ed inve an

teris-

con-

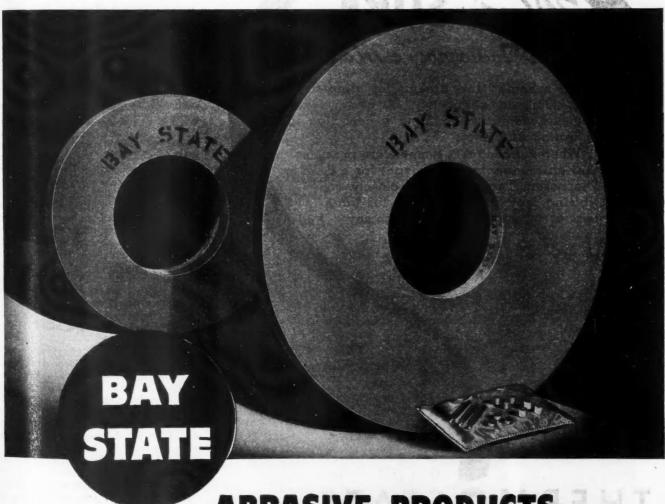
pe of utput peak drive the d not many de to rugtemparts e the e exoilcoolstion conhe erriolant some y be of oline arge for s. It perr all udes for

And whatever specifications you're demanding ... in respect to bond, grain, grade, shape or structure...a Bay State product can be provided to fill the bill—the first time and whenever you require those identical specifications.

Bay State's exclusive "fractional grading", "controlled porosity" and other features make it possible to achieve greater accuracy in meeting specifications on the original order and duplicating them exactly on each re-order.

Write us for literature on the types of grinding wheels you use.

BAY STATE ABRASIVE PRODUCTS CO. 6 Union Street, Westboro, Mass.



ABRASIVE PRODUCTS Top Performance Consistently Duplicated



eers aust

nost ient inienhas nce

ude m0-

out sive n a the

esel

IES

GRINDING WHEELS



HONING AND SUPERFINISHING STONES PORTABLE SNAGGING WHEELS









AND POINTS CUT-OFF WHEELS O INSERTED-NUT DISCS





AND CYLINDERS



small high-speed Diesel and gasoline engines, primarily because of its self-regulating characteristics and increased efficiency due to the utilization of the energy in the now wasted exhaust gas. Principal obstacles to the broader use of this device have been its high first cost and the problems incident to the high temperatures of the exhaust gas stream. Neither of these is considered as being insurmountable, what with present advances in metallurgy and the production art.

Bohuslav is convinced that for all around performance the turbocharger is superior to other types. It has the advantage of simplicity of installation owing to the absence of mechanical drives; and it has inherent economy because of the utilization of at least part of the energy in the exhaust gas which is now being charged as a loss.

#### **Technical Considerations**

Since there is considerable literature on the subject of modern internal engine design as well as analysis of the theory and design of superchargers, no extensive treatment of the subject need be made here. However, a few general comments, taken from the book, "Internal Combustion Engines" by L. C. Lichty may be pertinent. In general, the amount of charge inducted into en-

gine cylinders may be increased by the use of a supercharger which compresses and forces air or mixture at pressures above the atmospheric. The output of the engine is limited by the detonation characteristics of the fuel provided also that the engine mechanism is capable of withstanding the increased stresses. While a supercharger can be used to increase the charging effect at all speeds, it is particularly desirable at high speeds since normally aspirated engines have low volumetric efficiency under such operating conditions.

The amount of supercharge permissible depends upon the compression ratio, the detonation characteristics of the air-fuel mixture, and the inherent ability of the engine to withstand increased loads and heat stresses. An engine operating on a compression ratio that causes incipient detonation cannot be supercharged unless fuel with better anti-knock characteristics is used or unless the compression ratio is lowered. Although lowering of compression ratio reduces thermal efficiency, supercharging to the same detonation limit increases output which in many installations more than offsets the effect of loss in thermal efficiency. While a Diesel engine is not restricted to lower compression ratio when supercharged, if maximum pressure is limited it may be desirable to reduce the compression

To

which

give

engi

Bow

ena

tion

set

gri

plu

tag

pie

an

the

gi

TI

A recent discussion of the technical aspects of supercharging is found in an SAE paper "Some Problems Connected with Supercharging Diesel Engines" by E. W. Wasielewski, chief engineer, B-W Superchargers, Inc. Among other things the author showed that supercharging of Diesel engines with a Roots blower increased bmep while at the same time it decreased specific weight and specific volume. In analyzing a number of current engines, the author found the highest values of bmep to be about 110-psi unsupercharged, 135-psi supercharged. The best value of specific weight was approximately 11 lb per bhp unsupercharged, and 9.0 lb per bhp supercharged.

For a summary of investigations conducted by Ethyl Corp., the reader is referred to two papers—"An Investigation of Some of the Fundamentals of Supercharging," by R. B. Sneed; and "An Investigation of the Effect of Supercharging on the Performance of a 331 cu in. L-head Commercial Vehicle Engine," by the same author.

Fig 1 shows the comparative performance of a Buda commercial Diesel engine normally aspirated, and supercharged. It is of interest to note the increase in brake horsepower and torque peaks for the supercharged engine; also the fact that the supercharged engine is run at 1200 rpm instead of 1100. The supercharged engine produces a maximum of 286 bhp as compared with 222 bhp unsupercharged, an increase of approximately 29 per cent with a B-W supercharger.

Fig. 2, reproduced by permission of (Turn to page 114, please)



# THIS HEAD

by the

resses essures

nation ed also apable resses, sed to at all

ble at irated ciency ermisession

ics of nerent

nd in-

n en-

ratio

better

ed or vered.

ratio

harg-

it in-

f loss

Diesel

com-

ay be

nical

in an

ected ines"

neer,

other

uper-Roots

the

eight
ng a
nthor
to be
5-psi

spe-1 lb

tions

ader nvesntals need;

et of e of

Ve-

per-

iesel per-

the

and

en-

perin-

en-

bhp

per-

tely

ger.

RIES

PUTS ITS "Nose to the Grindstone"

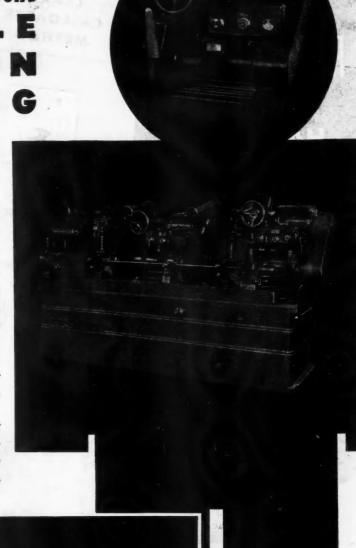
PRECISION GRINDING

To bring precision grinding the advantages which multiple tooling and combined cuts have given machined work in mass production, Fitchburg engineers put their heads together.

The result, the Fitchburg independent standard Bowgage Head, completely self-contained, and enabling one machine to perform as many operations as it has heads with which to grind.

For instance, a machine can be arranged for plunge-cut grinding one end and the second head set up for hydraulic traversing for longitudinal grinding, while the number three head is also plunge-cut grinding the other end. This is advantageous on gun barrels or long spindle type pieces where three operations are necessary—and all three operations will be performed within the time of the longest single operation!

If you have an "axe to grind" with your current production speeds and costs, let Fitchburg engineers show you how the Fitchburg method can be applied to your special problem. No obligation. Write today!





BURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A

Manufacturers of — Bowgage Wheelhead Units Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

THE HEAD. The Bowgage Head is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. The Fitchburg Triple-Head Machine illustrated is typical of the functional engineering and rugged construction of many special machines into which independent Fitchburg Bowgage Heads can be built to cut costs through multiple automatic precision grinding on mass production. It grinds three dimensions at the same time, within time of longest single grinding operation, and in one handling — with consequent saving in time and reduced danger of spoilage. By grinding several dimensions automatically on the same piece, at one mounting, it releases operator for other work.

Write Today for Catalog — Sent Free Upon Request



ples and methods that have enabled the Army and Navy to successfully handle in this war the burden of supplies, munitions and equipment.

Use the coupon below for your copy.

CLARK TRUCTRACTOR DIVISION 1001 JAMES STREET . BATTLE CREEK, MICHIGAN I would like a copy of your book "CLARK CARLOADER METHOD" Company\_ Address - Zone -\_\_State\_

the Ethyl Corp., shows the results of a comprehensive series of tests an provides comparative relationships o performance curves, intake manifol pressures, and fuel consumption. The relate to the same engine, normall aspirated and supercharged.

Volu

Fig. 3 provides comparative torqu horsepower, and fuel economy curve for the Cummins NHB-600 Diesel en gine, unsupercharged; and the NHBS 600, the supercharged version of the same model. It will be noted that th engine with normal aspiration produces 200 hp while the supercharge model delivers 275 hp, a gain of 37, per cent. Fig. 4 shows the comparative performance of Graham supercharge and conventional engines.

#### Summary of Advantages

A report submitted by the Michigal Tool Co., whose Cone-Drive mechanism was responsible for the outstanding centrifugal supercharger installation on Graham cars, claimed the following advantages for this application are:

1. Power increase from 30 to 40 per cen without increasing the size, weight, o displacement of the engine.

This increased power delivered with 15 to 25 per cent less specific fuel consumption An increase in motoring comfort, safety and enjoyment because of greatly improved acceleration and smoother performance.

Experts are agreed that the reduction in roughness of combustion and the additional smoothness which come from better fuel distribution are among the greatest talking points so far as passenger car engines are concerned.

Coming to commercial engines, it is obvious that the proper supercharger installation can be employed to advantage competitively to achieve high performance by increasing the efficiency of the normal engine, and by raising its output without increasing physical size or weight. Under these conditions the specific weight and displacement will be decreased materially while fuel economy should be increased considerably. In engines used at high altitudes the effect of supercharging is even more dramatic.

If and when the turbocharger becomes available for general use on automotive engines it will offer unquestioned advantages since, in addition to other economies inherent in the principle, it takes none of the power from the engine for its drive and recovers part of the otherwise wasted energy of the exhaust gas stream.

#### **Advertising Notes**

Klau-Van Pietersom-Dunlap Associates, Inc., Milwaukee advertising agency, has just announced the election of George J. Callos as vice president and account executive.

William D. Strohmeier, formerly with Piper Aircraft Corporation, Lock Haven, Pa., and the Hawthorne School of Aeronautics at Orangeburg, S. C., has joined Charles H. Gale Associates, New York public relations counsel, to handle a number of aviation accounts.